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The novelty of John Lilly`s play "Endymion" and translation difficulties of Euphuistic style

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Abstract

The novelty of John Lilly`s play «Endymion» and translation difficulties of Euphuistic style are investigated. The focus of Lilly`s interpretation is devoted to an allegory of love of well-known historical characters: the Queen of England Elizabeth I and Robert Dudley, the 1st Earl of Leicester, an English statesman. Interpreting the antique material about Endymion, Lilly fills the play with a new humanistic content. The distinctive features of the play are following: actualization of the Renaissance realism themes (love, friendship, compassion, fight against evil), allegory and symbolism, a prosaic dialogue, the use of a parallel action in a comedy, the development of the category of wit. An euphuistic style created by Lilly allows to reproduce the peculiarities of the language of aristocratic circles in the late 16-th early 17-th centuries, and the ambiance of the Elizabethan court that`s based on the cult of the monarch, praise of the Queen. Lilly`s merit is creation of a new genre of the court culture – a comedy of masque as early modification of Shakespeare`s lyrical comedies. All basic typical features of the masque as genre are obvious in Lilly`s play: escape to the world of abstraction and symbols, the frequent confusion of the images of ancient mythology and fairy tales, decorative splendor and linguistic expressiveness. The translation difficulties are caused by medieval language peculiarities as well as Lilly's peculiar mannered Euphuistic style.

Key words: myth, Endymion, humanistic orientation, the transformation of the ancient material, a comedy of masque, Euphuistic style, Elizabethan court culture.

English literature of the Renaissance is always of peculiar interest. One of the authors attracting attention is an Elizabethan writer and playwright, the founder of "Euphuistic style" John Lilly (Jill Lyly, Lilly, Lilie), 1553 (4) -1606). Today there are many critical works devoted to the life and creativity of this Renaissance author, as well as literary analysis of some of his works. Nevertheless the novelty of Lilly`s play «Endymion» and translation difficulties of euphuistic style haven`t been investigated yet. The purpose of this article is to study the peculiarities of the poetics and genre nature of Lilly`s comedy of masque "Endymion" (1591). An attempt to research the genre nature of this little-known Lilly`s comedy determines the scientific novelty of this article, which allows us to broaden the notion of the national artistic peculiarities of the Renaissance

reception of the ancient myth and show the translation difficulties of euphemistic style.

As for the methods of investigation they are following: Comparative historical analysis of the myth sources; analytical method ànd mythopoetic analysis of literary interpretation.

The play "Endymion" opens a series of court comedies by Lilly, which also includes: "Campaspé" (1584), "Sapho and Phao" (1584), "Gallathea" (1592), "Midas"(1592), "Mother Bombie" (1594), "The Women on the Moon" (1597) and others. The basis of the plot of the five-act comedy "Endymion" is love story of Endymion to the Goddess Lady-Moon or Queen Cynthia. The characters of the play have their real historical prototypes. For instance, the image of Endymion as an ideal, combining "the gift of eloquence, sophisticated gallantry of a brave knight" [1, p.110-111] embodies features of Robert Dudley, the Queen's favorite. Elizabeth I is represented by two characters such as the Goddess Lady-Moon or Queen Cynthia. The image of the Lady-Moon was rather popular in the Elizabethan art, because it allowed to emphasize the most impressive iconic features of the ruling Queen [2, p. 215-216]. The symbolism of the names of the Lady-Moon (Cynthia, Selena, Diana, Artemis, Hecate, Trivia) reflects the virtues of the Queen. Moreover reflecting Platonic aesthetics (two Venus as the personification of two kinds of Love) Lilly associates earthly, physical love with the image of Cynthia, and the Goddess Lady-Moon represents heavenly, intelligible one. Thus, an ancient Greek myth about the love of the goddess Lady-Moon to Endymion received an allegorical subtext and became the object of creative rethinking and a source of literary interpretation for Lilly.

Like Spencer`s (1552-1599) "Fair Queen" (1590-1596) Lilly`s play has a duality of storyline so called "double plot" [3,p. 67-75]. Allegoric feature of the play is beyond doubt. While some critics try to guess historical prototypes of the characters [4, p. 10], others seek how the allegory of the Christian images are revealed [5, p. 107]. In the preface to the latest edition of "Endymion" (1997) American

critics differentiate the allegorical plan of Lilly's comedy, singling out the allegories of power [6, p. 35], politics [7,368, p. 79] and religion [6, p. 27], sleep [6, p.21], desires [6, p.24], cosmic and neoplatonic allegories [6, p.15], allegory of the plot [6, p. 37, 18]. The play itself is a great allegory of well-known historical fact about cooling between Queen Elizabeth and her lover Robert Dudley in connection with his marriage to lady Sheffield in 1572.

Lilly`s comedy is considered as a significant transformation of ancient Greek myth about Endymion. By interpreting the ancient material, the author demonstrates the obvious connection with the contemporary era as well as fills the play with a new humanistic content. The variety of themes raised in the comedy reflects his humanistic focus, namely the interest in man's inner world (Endymion`s suffering), a manifestation of human dignity (Tell's struggle for his female happiness), an example of strong friendship (Eumenides) and true love (Endymion and Cynthia). The center of attention is the interpretation of Lilly`s depiction of the allegory of love, the world of feelings of famous historical characters. Despite playwright`s desire for true describing of the court events, the behavior of his characters are determined by Renaissance aesthetics prevailing in the Elizabethan culture, in particular the concept of Platonic love with "preference of the mind over body". It explains Cynthia`s self-sacrifice reflecting Elizabeth`s refusal from her personal happiness in her real life. Transforming the theme of "an eternal sleep" Lilly illustrates Plato's view about "a bitter love that is compared with dying". Unlike myth, the theme of Endymion`s beauty is replaced by praising of Elizabeth`s beauty in the play. The cult of the Queen was dominant in all court art works of that time. Lilly's play was no exception. Numerous repetitions of the word "beauty" in the comedy "Endymion" actualize the cult of Elizabeth I: "Beauty diuine", "Her greatest beauty", "The pride of beauty", "unspeakeable beauty". Following traditions of the court art Lilly excessively saturates the play with compliments and numerous praises of Elizabeth. Sometimes, it is a frank flattery, for

instance, "A Greek philosopher Pythagoras states: "I had rather in Cynthias Court spende tenne yeers, then in Greece one houre". And an Egyptian soothsayer Gyptes says: "And I chuse rather to liue by the sight of Cynthia" [4, p. 79]. The play has 30 characters. These are courtiers, their servants, fairy creatures, artistic images created by the imagination of the playwright. However, the Queen and her court knight Endymion are in the center of the work. The characteristics of personages are distinguished by individuality. Their language is socially marked. So Lilly transformed the ancient myth about Endymion in the context of a particular socio-historical situation and the cult of the monarch. Unlike myth, the Renaissance Endymion is a representative of the English aristocracy of his time, a court knight, who has his own historical prototype. Endymion has an active life position. He loves passionately. According to Plato, "dead sleep" and resurrection of the character should be perceived as a manifestation and victory of love. The power of love (kiss of the Queen) dissipates the magic of sleep. Endymion becomes young again.

As for the genre of Lilly's play according to American criticism the writer is the creator of court comedies [8, p.67]. The same opinion is expressed by Russian literary critic N.V. Zonina, who considers the English masque of the XVI-XVI centuries only as a court action [9, p.40-42]. Nevertheless A. Bartoshevich notes that Lilly is the first to have combined the principles of "romantic" comedy with scholars of humanistic traditions. Like folk "romantic" drama, Lilly's comedies tell about the strangeness and the whims of love, the adventures of lovers. However these plays (their ideas and form) were originated by the court culture [1, p.109]. In our opinion the problem of determining the genre of "Endymion" by Lilly is explained by its synthetic character. So, the author tried to combine following elements in his play: the Roman writer Lucian`s (125-180 CE) dialogue between Lady-Moon and Venus; the synthesis of the Italian Comedy del Arte and the Latin comedy of Plautus (254-184 BC) and Terence (19 (8) 5-159 BC) and the masque as an entertaining holiday subordinated to the cult of the monarch. A court

poet often faced with the creation of a masque, that was popular in the XVI-XVII centuries. It was court costume action (most often devoted to antique, mythological and fairy tale themes), the main characters were allegorical figures. The play "Endymion" has got a number of the masque features. A masque was usually created before any important event associated with a person of the monarch. The play "Endymion" was also written for Celebration of Candlemas. Moreover it is characterized by all main features of masque: the leaving for the world of abstractions and symbols, negation of reality, frequent mix of antique images, mythology and fairy tales, the contrast of images and motifs, decorative splendor, abundance of self-sufficient details and incredible expressiveness of expressive means. Everything is directed to astonish and admire the spectators [9, p.40-42].

The play "Endymion" is distinguished by the atmosphere of a fairy tale filled with a system of symbols and allegories. Unraveling the symbols was daily practice at the court. Seeing allegory in all, the man of that time gradually learned and expressed himself using allegories, embodying his thoughts in the form of riddles. Reread the play again using the dictionary of symbols [10] as the key to decrypt Lilly`s interpretation from the depths of centuries. We meet a number of symbols that characterize the complexities of the relationships between Endymion and the Queen. For example, "the sea with its tides" means the parallel with the change of lunar cycles (a new moon, a full moon) and symbolizes the variability of feelings between Elizabeth I and Leicester. The vine that covers the body symbolizes "youth". The symbols are woven into an expanded author's metaphor and form an inseparable whole. Tellus (Endymion`s former lover or in reality Maria Stewart or the second wife of Dudley, Lady Sheffield) is considered as the personification of the earth, that often denotes "hell" [11, p.467]. Her seeking revenge and appeal to the witch means a destructive aspect. Witch Dips, threatening Endymion with a knife denoting a symbol of revenge and death, puts the character to "dead sleep" with the help of a magic powder. "Death" means "omniscience", because the dead see everything. Obviously, speaking of "dead

sleep", the author implies a period of rethinking of complex relationships between Elizabeth and Robert Dudley. Another popular symbol in the play is "garden" that symbolizes "paradise", meaning the court of the Queen, and the gardener is "the creator" Elizabeth I herself. The garden also embodies the female, protective principle and means "innocence". "Innocence" is often associated with Elizabeth`s image. From the point of view of Christians "fenced garden" is a symbol of Virgin Mary. The image of Virgin Mary was wished by Elizabeth for comparison with her. To save Endymion Cynthia sends messengers to Egypt, Greece, and Tellus is put in prison in the desert, symbolizing the "solitude and a place for reflection". Fascinated by the beauty of Tellus, captain Corsites agrees to fulfill her wish to remove sleeping Endymion into the cave meaning "a place for burial and rebirth". However, Corsites cannot do it because Endymion is as heavy as a stone that means a symbol of stability, durability, reliability, immortality, permanence, eternal, clutch, indestructibility or allegorical form of expression Dudley`s constancy of love for Elizabeth I. Corsites can`t remove Endymion because he is sleeping on the Birch bank. "Birch" is always considered as a symbol of fertility and light, it also protects against witches and evil spirits. Indeed, the fairies protect Endymion. They start pinching Corsites to turn him into a leopard denoting a symbol of cruelty and ferocity, aggression and fearlessness. Leopard`s spots resemble "eyes" to guard. According to the play, the captain Corsites is really Cynthia`s guard who betrays her. The rill shows Eumenides the way how to save his friend Endymion. "The rill" symbolizes "female source, the womb of the Great Mother, the soul". Moreover, it represents the union of male and female, salvation and purification. Indeed, Endymion`s rescue from the enchantment is brought by the kiss of Queen Cynthia. "A kiss" is a sign of "good mood, light, trust, reconciliation, affection". So, all these are allegorical clues which show the Queen Elizabeth`s favor in relation to Robert Dudley. Symbolism of Endymion`s sleep deserves special attention. The old man gives a book with three pages. The book means "a book of life, the spirit of wisdom". It allegorically

accentuates Dudley`s trying to analyze the causes of Elizabeth's cooling and finds the answer. The reason is the treacherous intrigues of the court. The image of "a wolf" embodies evil, devouring passion and rage, enemies. "An eagle" (a solar symbol of God on the earth) is a symbol of power and strength. The notion "under the wing" means "Elizabeth`s court" and small, worthless drones and beetles are associated with the courtier dependents, that "searched for a vein" ("a weak place") to "exsanguinate" to deprive Elizabeth of power. Thus, Lilly, using an allegorical form, conveys the real atmosphere of Elizabeth's court. The author also widely uses allegories for characteristics of secondary characters. So, the image of Sir Tophas is associated with the donkey as a symbol of stubbornness, stupidity and lust actualizing the features of the character. The transformation of Bagoa into a sedge as a symbol of pity emphasizes her sympathy for Endymion. Lilly often uses "speaking names" and word-formation to describe characters in the play. For example, according to Dictionary[12], Favilla means "an ashes"; Scintilla – "a spark"; Eumenides ("Eu-" - the prefix with the meaning "good") that is the best friend; Pythagoras ("Pyth" – "persuade", "agoras" – "to speak") that is a philosopher-speaker; Epiton ("Ep"- a prefix with the meaning of "to follow someone") that is a page of Sir Tophas; Semele means a mistress of Zeus. Another innovation in the play is the introduction of a parallel action drama, in most cases comic when secondary characters compete in wit. The author introduces a completely new type of comedy to the drama, which has nothing with the popular comedy "Ralph Roister Doister" by N. Udall (1553) or other comedies of that time. Lilly`s humor, a philosophical irony partially became the basis for "lyrical" comedies by Shakespeare ("A Midsummer Night's Dream", 1595/96, "Love's Labour's Lost", 1623 etc.) [13,p.69]. The problem of love and happiness is solved with extraordinary ease and joy in the court comedy of masque. No one of the characters suffers (magic spell is removed from Endymion, and Tellus is released from prison). Despite the fact that the intrigue in the comedy prevails over the depth of characters, the play contains dynamic dialogues of secondary

characters with a different satire orientation (Tophas, Dar, Epiton, Samias). Moreover the speeches of the personages are expressive and socially colored. The peculiarity of "Endymion" is not only comic development of the plot (misunderstanding, recognition, false actions), but also it is based on rich potential of the linguistic means, which allow to convey a comic in the language of the characters. The comic situations of the play are achieved due to the use of irony, as a hidden mockery especially regarding Sir Tophas: "Samias. O that we had Sir Tophas? That brave Squire, in the middle of our myrth" or "Samias. Stay your courage valiant Knight, for your wisdom is so wearie that it stayeth it selfe" [4,p. 26]. At the same time, comic situations are achieved by using of aphorisms and mixing of languages (the adding of Latin expressions in English speech). The language of Sir Tophas includes philosophical quintessence and Latin expressions, which can be regarded as a parody of the Italian mask of Doctor; also and the expressiveness of Sir Tophas defines his similarity with the Italian mask of Captain. Puns and alogisms are also used to achieve a comic effect: "Tophas. Freendes Nego argumentum. Sam. And why not friends? Tophas. Because Amicita (in the Old Years We find) is inter pares: now my pretty companions, you will see how you can not be mee: but I will not cut you off completely, you be my half friends, for reaching to my middle, so farre as from the ground to the wast I wil be your freend" [4,p.27]. Lilly's variety of laugh (humor, irony, joke, ridicule, pun) reflects the richness of reality and forms of the category of laughing culture that is wit.

The role of rhetorical question in the context of a prosaic play is of particular interest. We support A. Bartoshevich`s opinion  that Lilly`s comedy conveys "the atmosphere of rhetorical debate, the discussion of moral problems, the collision of different points of view, dialogues built on antitheses and parallelism completely taken from "Euphues" [1, p. 111]. As the artistic analysis of the text shows Lilly uses rhetorical question not only as an element of the Platonic dialogue, which is very

popular in the XVI century, but also to reproduce the inner monologue of the character. For instance, Endymion's suffering are shown as rhetorical figures including a series of short questions: "Sweet Cynthia, how would you be pleased, how possessed?" [4,p.23].

The most successful linguistic form of expression of allegories and symbols in the play is Euphuistic style that helps to reproduce the atmosphere of Elizabeth`s court to show "eloquence, an exquisite politeness" [1.p.110-111]. The author of Euphuistic style in England (that was first presented in his novel "Euphues" in 1580), reflecting the spirit of the Elizabethan era, uses it as a background of comedy of masque. The four Endymion`s monologues addressed to the Queen should be considered as bright examples of Euphuistic style. Complex sentences marked by excessive use of antithesis, alliteration and similes drawn from mythology and nature contain long author's metaphors, often several garlands of allegory mixed with symbols. Often, the key note is actualized by several synonymic antitheses: "There is no thought more admirable or commendable in the sea, then the ebbing and flowing, and the moone, from whom the Sea takes that virtue, be accounted fickle for encreasing, and decreasing ?" [4, p.22]. It is out of the question, Euphuistic style causes great difficulties in translation. The first translation of the play from the original language was made by L. Fomina in 2014 [14, p. 16-88]. To achieve an adequate translation of the artistic text written in Euphuistic style from English into Ukrainian a number of translation transformations are used. The most typical grammatical transformations are following: Addition: "perfection" → "закінчена досконалість"; Omission: " by the greatest virtue" → "чеснотою"; and lexical ones (Transcription: "Endymion" → "Ендіміон"; Concretization: "and mornings that grow to evenings"→ " як ранки змінюються вечорами"; "Moon"→"Леді Місяць"; Generalization "trees"→ "рослини"; Antonymic translation "When malice cannot object anything" → "Коли зло стає безсилим". Paraphrasing: "nor blossoms accounted till they be ripe fruit" →"а стиглий плід неможливий без

цвітіння". To translate even one sentence in Euphuistic style a combination of several translation transformations is often used. For example: "But thou, to abate the pride of our ... affections" → "Але ти, щоб применшити (Paraphrasing) нашу любов (Concretization)"; or " whose fair face neither the summer's blaze can scorch nor winter's blast chap, nor the numbering of years breed altering of colors?"→ "…чиє прекрасне обличчя ні сонце влітку, ні вітер взимку не можуть обпалити, а роки (Omission) не можуть змінити (Paraphrasing) його колір?" [4, p.22]. Moreover, the presence of obsolete words to reproduce the language of the Elizabethan court also causes difficulties in translating. For instance, an obsolete word "doth" was used in the past as the third person singular of the present tense of the verb "do": he/she/it doth = he/she/it does. Other obsolete words in the play are following: the word "thou" means an old-fashioned form of "you" and "hast" denotes " old second person singular form of the verb "have". For instance. "O Cynthia, if thou (MnE: you) shouldst (MnE: should) always continue at thy fullness, both gods and men would conspire to ravish thee (MnE: you)" [4, p. 22].

So translation of the artistic work written in Euphuistic style abounded by obsolete words requires knowledge of the History of English too. The language of the play causes linguistic curiosity but it is the subject of another special study.

The use of Euphemistic style can be considered a genre-forming feature of the court comedy of masque, which reproduces as features of the language of the aristocratic circles of the late XVI - early XVII centuries, and the way of praising and flattery of Queen Elizabeth. The playwright of England was the first to use the masque as well as an integral part of the full-length play, which can be regarded as an artistic method of "play in the play". Another Lilly`s merit is the first usage of prose dialogue instead of the verse, bringing the comedy closer to life.

Thus, Lilly created a new genre - the court comedy of masque. Lilly's "Endymion" influenced the development of theatrical art and world literature, including Shakespeare`s comedies that developed and raised the skill of exciting action constructing, the power of conflicts and the depiction of human feelings and passions. Thus the innovation of Lilly's creativity is evident and it is of interest for further research.

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Новизна пьесы Джона Лилли «Эндимион» и трудности перевода эвфуистического стиля
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Аннотация:

Исследуется новизна пьесы Джона Лилли «Эндимион» и трудности перевода эвфуистического стиля. В центре интерпретации Лилли аллегория любви известных исторических лиц: королевы Англии Елизаветы I и Роберта Дадли, графа Лейстера, английского государственного деятеля. Интерпретируя античный материал об Эндимионе, Лилли наполняет пьесу новым гуманистическим содержанием. Отличительными особенностями произведения являются: актуализация тем ренессансного реализма (любовь, дружба, сострадание, борьба со злом), аллегоризм и символизм, введение в пьесу прозаического диалога и параллельного действия, развитие категории остроумия. Эвфуистический стиль, созданный Лилли, позволяет воспроизвести особенности языка аристократических кругов Англии конца 16-го- начала 17-го веков и атмосферу елизаветинского двора, во которой царил культ монарха, лесть Королеве. Заслугой Лилли является создание нового жанра придворной комедии масок как ранней модификации лирических комедий Шекспира. Все основные жанровые черты маски характерны для пьесы Лилли: бегство в мир абстракции и символов, смешение образов древней мифологии и сказок, лингвистическая выразительность. Трудности перевода обусловлены особенностями средневекового языка и эвфуистическим стилем.

Ключевые слова: миф, Эндимион, гуманистическая ориентация, трансформация древнего материала, комедия масок, эвфуистический стиль, елизаветинская придворная культура.

Новизна п'єси Джона Ліллі «Ендіміон» і труднощі перекладу евфуістичного стилю
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Аннотация

В данной статье раскрываются проблемы системы управления качеством обучения английскому языку в высшихобразовательных учреждениях Республики Узбекистан. В статье рассмотрено развитие научных понятий "качество образования" и "управление качеством образования".

Ключевые слова: образовательная политика, качество образования, диагностика, образовательный процесс, мониторинг, формирование,методическое обеспечение.

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Trends of improving the quality management of the English language in the higher educational institutions in the republic of Uzbekistan

Abstract

The article is devoted to the problems of the quality management system of teaching English in higher educational institutions of the Republic of Uzbekistan. The development of scientific concepts "quality of education" and "quality management of education" are also regarded inthe given article.

Keywords: *educational policy, quality of education, diagnostics, educational process, monitoring, formation, methodological support.*

Отличительной особенностью развития мирового сообщества в настоящее время является повышение роли качества обучения английскому языку, которое является одним из важнейших условий успешной социализации личности. В преамбуле к Рекомендациям Комитета министров Совета Европы подчеркивается необходимость подготовки людей к решению задач, возникающих в связи с более тесным сотрудничеством в области образования, культуры и науки.В частности, отмечается, что "только совершенствуя изучение современных языков, можно содействовать коммуникации и взаимному общению, повышению свободы передвижения населения, развитию взаимопонимания и сотрудничества, преодолению предрассудков и дискриминации"[1].

В ведущих зарубежных странах проблему обучения иностранному языку, в частности английскому языку в высших образовательных учреждениях, рассматривают с точки зрения совершенствования его качества, проводят исследования в таких направлениях, как совершенствование содержательного и учебно-методического обеспечения, технологийобучения, а также объективности контроля. Кроме этого, совершенствование управления качества обучения английскому языку в образовательных учреждениях, являясь приоритетным направлением государственной образовательной политики, считается самостоятельным направлением научного поиска и одной из актуальных задач педагогической науки. Такой подход обусловливает востребованность налаживания системы менеджмента качества обучения английскому языку.

С первых лет независимости в республике Узбекистан уделяется особое внимание налаживанию системы обучения иностранным языкам, подготовке квалифицированных специалистов на основе передового опыта,

широкому внедрению в данную сферу современных педагогических и информационно-коммуникативных технологий и инновационных методов образования. В результате проведенных исследований в непрерывном образовании внедрена система эффективного обучения иностранных языков. Наряду с реализованной работой в настоящее время есть необходимость повышения качества эффективного и систематичного обучения английскому языку. В Стратегии действий по дальнейшему развитию Республики Узбекистан поднимается вопрос о "повышении качества и эффективности деятельности высших образовательных учреждений на основе внедрения международных стандартов обучения и оценки качества преподавания"[2], что определяет важность проведения исследований, направленных на совершенствование системы управления качества обучения английскому языкувысших образовательных учреждениях.

В настоящее время качество образования приобрело новое звучание в связи с идеями управления. Под управлением качеством образования понимают обеспечение проектирования, достижения и поддерживания качества условий образовательного процесса, его реализации и ре¬зультатов [8. С.203;9. С. 206;11. С.154].

Из данного определения, следует, что объектом управления являются конструкционные (внутренние) и функцио-нальные (внешние) свойства образовательного процесса, условий, в которых он протекает, а также его результатов [13. С.272;1. С.203;2. С.157]. Рассматривая проблему, мы сделали вывод, что необходимо управлять не тем или иным компонентом образовательного процесса, а свойствами (способами проявления) этих компонентов, их соответствием определённым нормам. Однако наиболее полная и чёткая трактовка этого феномена базируется на идее рассмотрения управления качеством образования через

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[1] Цели и задачи языковой политики Совета Европы / http://studopedia.info/8-82090.html

[2] Указ Президента Республики Узбекистан «О стратегии действий по дальнейшему развитию Республики Узбекистан».
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результаты, направленные на регулирование показателей качества образовательного процесса [6. С. 62].

В монографии «Управление качеством образования», подготовленной Ш.Курбановым и Э.Сейтхалиловым[6. С. 173], под качеством образования на уровне ученика по¬нимается определённый уровень усвоения содержания образования (знаний, способов деятельности, опыта творческой деятельности, эмоционально-ценностных отношений), физического, психического, нравственного и граж¬данского развития, которого он достигает на различных этапах образователь¬ного процесса в соответствии с индивидуальными возможностями, стремле¬ниями и целями воспитания и обучения [6. С.204].

Нам близка точка зрения учёных, которые под качеством образования понимают соотношение цели и результата, меру достижения цели, притом, что цели (результаты) заданы операционально и спрогнозированы в зоне по¬тенциального развития обучаемого [6. С. 239]. Причём качество результатов образования следует отличать от качества образовательного процесса и качества образовательной системы.

В книге С.Шишова и В.Кальней«Мониторинг качества образования» качество образования определяется как социальная категория, опреде-ляющая состояние и результативность процесса образования в обществе, его соответствие потребностям и ожиданиям общества (различных социальных групп) в развитии и формировании гражданских, бытовых и профессиональных компетенций личности[12. С.279].

Следовательно, можно предположить, что качество образования есть со¬отношение цели и результата, мера достижения целей притом, что цели зада¬ны только операционально и спрогнозаны в зоне потенциального разви¬тия обучающегося. При этом результаты образования обяза¬тельно должны включать в себя и оценки того, какой ценой эти результаты

достигнуты.

Образовательный процесс, как известно, многосторонен, а потому и его результаты также разносторонне сложны, диалектически взаимосвязаны и взаимодействуют друг с другом, поскольку:
- в полной мере проявляются только спустя ряд лет, и нередко вообще вне сферы образования и потому непосредственно в ходе образовательного процесса не могут быть точно зафиксированы;
- зависят от огромного числа не только управляемых, но и случайных, неуправляемых факторов, а потому очень трудно установить точно, в итоге каких именно педагогических и управленческих действий, каких причин, какого компонента образовательного процесса дал тот или иной положительный или отрицательный результат образования; отсюда огромные трудности в уста¬новлении механизмов управляемости результирующих параметров.

Таким образом, само понятие качества образования образует множество значений, каждое из которых, в свою очередь, включено в различные социокультурные, системно-функциональные, индивидуально-психологические и иные контексты[10. С.29].В современных научных исследованиях качество образования и развития человека рассматривается как интегральная характеристика, как главная цель и самоценность активности самого человека, образовательной системы, общества в целом [7. С.109].В этой ситуации, особое значение приобретает фор¬мулировка базовых концептуальных представлений и методологических инструментов, позволяющих адекватно интерпретировать и моделиро¬вать качество образования во всем многообразии его проявлений (пара¬дигма качества).

Понятие «качество высшего образования» исторически формировалось на основе исторических «парадигм» образования[3. С. 189;4. С.56].Исторически первой сформировалась парадигма отсева: качество

определялось некоторым внешним требованием, для проверки соответствия которым устанавливались специальные испытания. В случае успешного прохождения испытаний, обучающиеся полу¬чали соответствующие дипломы или право на продолжение образова¬ния, в противном случае производился отсев. Парадигма оптимизации представляет собой несколько усовершенствованный вариант парадигмы отсева: качество по-прежнему рассматривается как степень соответствия тому или иному заданному извне стандарту, однако, помимо испытаний и отсева в образовательную систему вводятся дополнительные компоненты, связанные с доучиванием и коррекцией возникающих проблем и затруднений, с учетом возможно¬стей каждой конкретной образовательной системы. Парадигма менеджмента качества представляет собой более сложное понимание качества, как степени согласованности и удовлетво¬ренности множества различных интересов, предъявляемых всеми участ¬никами образовательного взаимодействия. Соответственно, речь идет не столько о стандартизации и директивном нормировании, как основных механизмах управления качеством, сколько - о разработке комплексных механизмов выявления и согласования образовательных потребностей, сопровождения индивидуальных образовательных траекторий, реализа¬ции комплексной диагностики и самодиагностики полученных результа¬тов. Наконец, парадигма стратегического управления качеством пред¬ставляет собой, в большей степени, формируемую, нежели уже сложив¬шуюся практику по выявлению стратегических приоритетов развития системы образования, определению места и роли образовательных ин¬ститутов в контексте социальных и экономических реформ, определе¬нию перспективных и еще не сформировавшихся образовательных по¬требностей.

Качество образовательных процессов, по сложившейся в педаго¬гике традиции, может

быть определено в нескольких аспектах[5. С. 88;6. С.289]:качество целей и механизма целеполагания (т.е. уровень и обоснованность целей, зафиксированных в нормативных документах и отражающих социальные потребности и личностные интенции);качество содержания (концептуальность, альтернативность и вариативность содержания, его гуманистический и гуманитарный харак¬тер, соответствие современным тенденциям в развитии культуры иобразования, возможность расширения и реконструкции содержанияза счет опыта всех субъектов образовательного процесса); качество программно-методического обеспечения (наличие и доступность современных программно-методических средств, учебников, соответствие их структуры и содержания актуальным тенденциям в

области развития теории образования); качество технологического обеспечения (определяет уровень используемых средств поддержки образовательной деятельности, такжеиспользование современных образовательных моделей).Качество образовательной системы также может быть рассмотрено и определено, как минимум, на трех уровнях[6. С.293;7. С.109]:

- качество внешних связей и отношений (качественные показатели

взаимодействия системы с внешней средой, ее способность отвечать

на изменения внешней среды, реализуя свои функции по отношению

к личности, обществу и государству, осуществляя ведущую роль в

социальном развитии);

- интегративное качество системы (способность системы к стабильному и эффективному функционированию при достаточно широком

диапазоне внешних воздействий, способность к реализации целесообразной образовательной политики, гармонизации внутренних проблем и противоречий);

- качество элементов системы (эффективно действующие подразделе-ния системы, обеспечивающие решение частных задач и

адаптацию к внутренним возмущениям и изменениям).

Управление качеством образования – это системное скоординированное воздействие на образовательную систему, образовательный процесс, а также на комплекс связанных с ним основных управленческих и поддерживающих процессов с целью достижения наибольшего соответствия параметров функционирования образовательной системы, ее социальных и педагогических результатов установленным и предполагаемым требованиям, нормам, стандартам и ожиданиям.Таким образом, постановка проблемы совершенствования управлением качества обучения английскому языку Республики Узбекистан изначально обусловлена изменениями нормативно-правовой базы системы высшего образования, произошедшими в последнее десятилетие. Другим источником изменения представлений об управлении качеством обучения английскому языку являются разработки педагогов, рассматривающих проблему качества обучения с точки зрения удовлетворения запросов потребителя. Наконец, качество обучения может быть рассмотрено с точки зрения существующих в системе высшего образования традиций и представлений о специфике и перспективах развития системы высшего образования.

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Predicting general mental health and exhaustion: the role of emotion and cognition components of personal and collective work-identity

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Abstract

The aim of this study was to investigate relationships between emotion and cognition components of personal and collective work-identity and self-reported general mental health and exhaustion, in Swedish teachers (N = 768). In line with our predictions, we showed that the emotion component of personal work-identity and the cognition component of collective work-identity associated positively with general mental health and negatively with exhaustion. The reverse result was found, however, for the cognition component of personal work-identity and emotion component of collective work-identity. In general, all this indicates that person-work bonding might, to some degree, account for general mental health and exhaustion in employees. In particular, the findings suggest that general mental health and exhaustion may vary symmetrically across the: (1) Type of person-work bonding (personal vs. collective work-identity); and (2) Type of psychological component (emotion vs. cognition) involved in personal- and collective work-identity.

Introduction

The phenomenon of work-identity is related to the question of "Who am I?" at work, that is, how we categorize and define ourselves in terms of individual and social attributes in a working context (Turner et al., 1987; Causer and Jones, 1996; Cappelli, 2000). Work identity, involving emotion and cognition processes accounting for psychological work bonding (Knez, 2016), can be divided into personal- and collective work-identifications associated with a wide range of work-related behaviors, norms and attitudes (Riketta, 2005; Riketta and Dick, 2005; Lee et al., 2015); as well as, with several aspects of self-reported mental health (see Haslam, 2014; Jetten et al., 2012; Haslam et al., 2009a; Steffens et al., 2016 for reviews).

In the context of work, mental health has been suggested to be reciprocally associated with job characteristics (De Lange et al., 2004). Associations between adverse mental health outcomes and work-related variables have been broadly framed within a psychosocial stress paradigm often focusing on work factors such as job strain, control-related constructs, and effort-reward imbalance (e.g., Stansfeld and Candy, 2006; Michie and Williams, 2003). The cardinal form of such stress-related health adversities have, as stemmed from the seminal work of Maslach (1976) and despite the multiplicities of definitions and operationalizations (Hakanen and Bakker, 2017; Schaufeli et al., 2009), predominantly been conceptualized as "burnout". Although definitions of burnout as a state of psychological distress caused by exposure to prolonged work-related stress vary considerably

depending upon manifestations and symptoms, a core component of exhaustion reoccurs in most of the current definitions and measurement models of burnout (Saboonchi et al., 2012; Grossi et al., 2015). Given the magnitude of social and individual costs and suffering linked to psychological distress associated with work-related stress, and the lack of specificity pertaining to the concept of burnout in clinical settings, a diagnostic entity labeled "exhaustion disorder" (ED; F43.8A) has been included in the Swedish version of the 10th revision of the International Classification of Diseases by the Swedish Board of Health and Welfare (Socialstyrelsen, 2003, 2010). Major diagnostic criteria for exhaustion disorder parallel descriptions of clinical level of burnout (Grossi et al., 2015) and include reduced psychological and physical energy, cognitive deficits, reduced ability to cope with demands and/or time pressure, emotional instability, disturbed sleep, and a host of associated physical symptoms (Socialstyrelsen, 2003; Saboonchi et al., 2012).

Although closely interwoven, approaching the concepts of burnout and exhaustion as if they would be interchangeable should be cautioned. Whereas burnout is an overreaching construct that holds a multiplicity of dimensions including recent conceptualizations that outlines it as a process rather than as an end state (Hallsten, 2017), exhaustion delineate an assessable concurrent ill-health status and symptoms of an individual that has been exposed to prolonged stress (for an overview see Schaufeli et al., 2017).

Work-identity
Work-identity comprises the emotional process of attachment/belonging/closeness, as well as the cognitive processes of thoughts, reasoning, and memories about, and mental travel to work (Knez, 2014, 2016), defining emotion and cognition components (work-related bonds) of work-identity. It occurs, furthermore, at multiple levels of abstraction including an individual level that refers to personal work-related associations, and a social level that relates to collective (group/organization) work-related associations (Pate et al., 2009). This is in line with, for example, McConnell (2011) who

suggested that the self involves multiple, context-dependent selves resulting in multiple identities.

In other words, we define and categorize ourselves in terms of individual attributes, encompassing personal self/identity (Hogg and Terry, 2000; Klein, 2014; Knez, 2016) and social attributes, involving collective self/identity (Jackson et al., 2006; Knez, 2016). Accordingly, work identity involves two identity levels linking two separate knowledge structures (Kihlstrom et al., 2003); that is, a personal and a collective work-identity (Riketta, 2005; Pate et al., 2009; Miscenko and Day, 2016).

Having a strong identity at one level does not, however, rule out similarly strong identity at another level, implying that the two types of identities are to some extent independent of each other (Brewer and Gardner, 1996; Pate et al., 2009). In addition, personal- and collective work-identity may differ in inclusiveness (Sluss and Ashforth, 2007; Miscenko and Day, 2016), resulting in different definitions and interpretations of the two types of selves/identities (Sedikides et al., 2011; Knez, 2016).

In view of that, personal work-identity includes categorizations of, for example, "My academic profession/work" and "I/Me, as a researcher in psychology". This incorporates the fundamental human need of distinguishing me from others (Brewer and Gardner, 1996) "in order to preserve the personal self, the personal story and its memories" (Knez, 2016, p. 3). Consequently, personal work-identity associates with personal self-related behaviors, motivations, attitudes, values, interests and cognitions (Ybarra and Trafimow, 1998; Johnson et al., 2006), suggesting that the stronger the personal work-identity the stronger the work-related personal goals, preferences and needs (Ybarra and Trafimow, 1998; Brewer and Gardner, 1996; Ellemers et al., 2004).

Collective work-identity, on the other hand, involves the We-descriptions (Knez, 2016), for example, "We working at the University of London". This type of distinction is consonant with our need to belong to a social group (Brewer and

Gardner, 1996) "in order to be part of the collective self, the collective story and its memories" (Knez, 2016, p. 3). Thus, collective work-identity embraces collective behaviors, motivations, attitudes, values, interests and cognitions (Ybarra and Trafimow, 1998; Johnson et al., 2006). Furthermore, and in line with social identity theory (Tajfel and Turner, 1979, 1986; see Hogg, 2012 for a review), this implies a depersonalization of the individual self, resulting in an attachment/closeness/belonging (emotional component) to the work-group/organization. Given all this, we could say that the more "collectivized" an individual is the stronger s/he will manifest acceptance, loyalty, adherence to decisions, beliefs, values and norms, communicated by the collective (Hogg and Terry, 2000; Ellemers et al., 2004; Johnson and Jackson, 2009); meaning that a depersonalized individual will disseminate motivational and normative mechanisms of the We-descriptions (Brewer and Gardner, 1996; Ybarra and Trafimow, 1998; Ellemers et al., 2004).

Following Knez (2014), Knez (2016) suggested a conceptual model for the phenomenon of work-related self/identity, involving emotion and cognition processes accounting for psychological work-bonding (see also Van Dick and Wagner, 2002). The emotion component involves the process of work-related attachment/belongingness/closeness, and the cognition component includes the processes of coherence, correspondence, mental time, reflection and agency (see also Klein et al., 2004; Conway et al., 2004). This model additionally implies that the concept of work identity may be defined as a higher order construct (Law et al., 1998; Stajkovic, 2006); that is, a knowledge structure that involves personal, autobiographical, work-related experiences (Knez, 2016).

Moreover, Knez (2016) suggested that the emotion component would precede the cognitive one when establishing work-identity (see also Knez and Eliasson, 2017; Knez et al., 2018 for a similar view). Based on autobiographical memory account (Klein et al., 2004; Conway et al., 2004; Knez, 2014, 2017; Knez and Nordhall, 2017; Knez et al., 2017) the Knez model (2016) is general in the sense that it proposes basic psychological processes

accounting for both personal work-identity and collective work-identity types of person-work bonding. This is also in line with the very definition of social identity as suggested by Tajfel (1972), comprising emotional and cognitive processes in identity formation (Tajfel, 1978; Haslam and Ellemers, 2011; Hogg, 2012).

However, collective- in contrast to personal work-identity is supposed to be more of a cognitive entity (Ashforth and Mael, 1989; Harquail and King, 2003), described as "a product of the dialectic relationship between collective, shared cognition on the one hand and socially structured individual cognitions on the other" (Corley et al., 2006, p. 88). For that reason we may expect that the cognitive component of collective work-identity (in terms of incorporation, identification and assimilation) will precede the emotional one (in terms of pride, esteem, and affective commitment) when collective-, in contrast to personal work-identity, is accountable (Mael and Ashforth, 1992; Van Knippenberg and Sleebos, 2006).

In differentiating between emotion and cognition components of personal- vs. collective work-identity, Nordhall and Knez (2018) recently showed that work-related outcomes may link differently to the emotion and cognition components of personal- and collective work-identity. More precisely, they reported that the effect of personal work-identity on self-determined work-motivation (Ryan and Deci, 2000; Gagne and Deci, 2005; Tremblay et al., 2009) was accounted for by the emotion component, and that the impact of collective work-identity on organizational pay-justice (Colquitt, 2001; Colquitt et al., 2013) was accounted for by the cognitive component. Accordingly, it is suggested that the emotion component of work-identity is primarily accountable when personal work-identity is in charge, and that the opposite is found when collective work-identity is responsible, predominantly involving the cognitive component of work-identity.

Accordingly, in this study, the concept of work identity emanates from two theoretical views, foci of identification (e.g., Reichers, 1985; van

Knippenberg and van Schie, 2000; Millward and Haslam, 2013): (1) an autobiographical memory perspective (e.g., Knez, 2014, 2016); and (2) a social identity perspective (e.g. Ashforth and Mael, 1989). Thus, we broaden the multiple focus of identification concept by suggesting that personal career/occupation can be treated at both an autobiographical memory level (individual) and an organizational/workgroup level (social). This means that career/occupation "can be conceptualized as one of the life goals that we strive for and find meaning in (Gini, 1998), analogous with Sisyphus rolling the boulder up the hill (Camus, 1942)" (Knez, 2016 p. 2).

Mental health and exhaustion

Burnout as the major manifestation of work-related psychological distress has been conventionally defined on the basis of dimensions of exhaustion, depersonalization, and reduced efficacy (Maslach and Jackson, 1981; Maslach et al., 2001; Maslach and Leiter, 2008). The current accounts of exhaustion (Grossi et al., 2015) ascribe a lack of energy in social interactions, physical fatigue, inability to accomplish/cope with everyday demands, impaired memory, concentration difficulties, sleeping problems and emotional instability to this core component of burnout (Saboonchi et al., 2012). Although work environmental factors have broadly been considered as primary determinants of burnout (De Lange et al., 2004; Stansfeld and Candy, 2006; Michie and Williams, 2003), individual differences in burnout have also been addressed to account for the variability of manifestations of burnout among individuals within similar work environments (Alarcon et al., 2009; Langelaan et al., 2006; Schaufeli et al., 2002).

It has been previously indicated that prevalence of burnout syndrome might be higher among teachers compared to other work groups. For example, about 9.6% of Swedish teachers suffer from burnout compared to a prevalence of 6% among other Swedish occupational work-groups (Hallsten et al., 2002). Since teachers' work involves psychological demands (Demerouti et al., 2001) in terms of prosocial extra-role interactions with students,

colleagues and students' parents (Maslach et al., 2001), teachers are regarded as an especially sensitive group in developing the burnout syndrome as a consequence of stress related work overload (Santavirta et al., 2007; Aloe et al., 2014; Zee and Koomen, 2016).

Negative work-related outcomes of exhaustion, at personal and collective levels, are job turnover, lower job satisfaction, productivity and performance, as well as increased job absenteeism. Exhaustion has, additionally, been associated with increased risk of cardiovascular disease and heart attacks (Angerer, 2003; Ybema et al., 2010). A growing body of research has also suggested that work engagement might be considered as the opposite side of the burnout syndrome (González-Romá et al., 2006; Maslach and Leiter, 2008; Maslach, 2011; Lammers et al., 2013).

Present study

Previous studies on work-identity and mental health have, to a large extent, investigated links between collective work-identity and different health outcomes (Jetten et al., 2012). Accordingly, work-identity has mostly been framed in terms of social identity (Van Knippenberg, 2000; Van Dick and Wagner, 2002; Bjerregaard et al., 2015) and related to health and wellbeing outcomes (Haslam et al., 2009a,b; Jetten et al., 2012; Haslam, 2014; Jetten et al., 2014; Steffens et al., 2016). More precisely, negative associations between different types of collective work-identity and chronic anxiety and depression (Bizumic et al., 2009; Cruwys et al., 2014), workplace stress (Haslam et al., 2005; Haslam et al., 2009b), and psychological distress (Wegge et al., 2006) have been reported. Collective work-identities have also been shown to reduce self-reported stress (Haslam and Reicher, 2006; Wegge et al., 2012) as well as to negatively correlate with exhaustion and other burnout components (Wegge et al., 2006; Haslam et al., 2009b). All in all, this indicates that high levels of collective work-identity may operate as a psychological buffer against the negative impact of work-related stress (Jetten et al., 2012; Haslam et al., 2009a,b).

Why is collective work-identity negatively related

to psychological distress, stress, and exhaustion, but positively linked to mental wellbeing? Probably because collective work-identity provides social support to the members of the collective (Cohen, 2004). Several findings have indeed indicated that social support may mediate the associations between collective work-identity and stress, burnout, and wellbeing (Crabtree et al., 2010; Haslam et al., 2005). In addition, relationships between collective work-identity and mental wellbeing have been indicated to be even stronger when dimensions of collective work-identity are shared among members of the collective (Cohen, 2004; Jetten et al., 2014); especially when cognitive dimensions such as perceived control (Greenaway et al., 2015) and positive attributions of collective work-identity are involved (Cohen, 2004; Jetten et al., 2014; Cruwys et al., 2015).

Only a few studies have, however, addressed the links between personal work-identity and health outcomes. Edwards and Dirette (2010) reported a negative link between personal work-identity (operationalized as professional identification) and the burnout syndrome, comprising exhaustion. Lammers et al. (2013), however, indicated that both personal- and collective work-identity were negatively related to exhaustion. This is probably due to the different definitions of work-identity involved in previous studies (Pate et al., 2009; McConnell, 2011; Sedikides et al., 2011); not dividing and defining emotion and cognition components of work-identity when investigating relationships with different types of work-related outcomes (Corley et al., 2006; Harquail and King, 2003; Knez, 2016; Knez et al., 2018; Nordhall and Knez, 2018). Kremer and Hofman (1985), on the other hand, did address different types of work-related-self-presentation-profiles as personal work-identity in predicting burnout. They reported that all types of personal work-identity-profiles were negatively associated with burnout, but that this association was strongest for the emotional component of personal work-identity, followed by the cognitive one. Also Van Dick and Wagner (2002) indicated that emotional-, compared to the cognitive component of personal work-identity, might negatively associate with a decrease in health

and wellbeing.

Finally, Stets and Burke (2000) showed that job stressors may positively relate to psychological distress in employees reporting high levels of job involvement, defined as a cognitive component of personal work-identity (Frone and Russell, 1995). In line with this, it has been shown that obsessive work-passion, a type of job involvement, may positively predict exhaustion. This may in turn be explained by the concept of intense rumination involving repetitive and unintentional perseverative thoughts about ones work (Donahue et al., 2012). Additionally, Fisherman (2015) reported that the emotion component of personal work-identity may negatively associate with exhaustion, while the cognition component may positively link to exhaustion.

Given the above, the aim of this study was to investigate relationships between emotion and cognition components of personal- and collective work-identity and self-reported general mental health and exhaustion in Swedish teachers, indicating higher prevalence of burnout syndrome compared to other work groups (Hallsten et al., 2002). The links between emotion and cognition components of both personal- and collective work-identity and work-related mental health and exhaustion have, as far as we know, not been addressed by previous studies.

Hypotheses
Hypothesis 1. In line with, for example, Kremer and Hofman (1985), Van Dick and Wagner (2002), and Fisherman (2015), who indicated that emotion-compared to cognition component of personal work-identity might be notably more pronounced in the negative links between personal work-identity and burnout dimensions, we predicted (a) a positive association between emotional personal work-identity and general mental health, and (b) a negative one between emotional personal work-identity and exhaustion. These relationships were, subsequently, expected to reverse for the cognition component of personal work-identity; that is, a negative association between cognitive personal work-identity and general mental health and a

positive one between cognitive personal work-identity and exhaustion were predicted.

Hypothesis 2. In line with, for example, Jetten et al. (2014), Cruwys et al. (2015) and Greenaway et al. (2015), who indicated that in particular the cognitive component of collective work-identity might be positively related to mental wellbeing, we predicted (a) a positive association between cognitive collective work-identity and general mental health and (b) a negative one between cognitive collective work-identity and exhaustion. These relationships were, subsequently, expected to reverse for the emotion component of collective work-identity; that is, a negative association between emotional collective work-identity and general mental health and a positive one between emotional collective work-identity and exhaustion were predicted.

Methods

The present study is a part of a larger research project on work-identity and health, resulting in several publications. Accordingly, the method section is consonant, in general terms, with previous publications within this project (Nordhall and Knez, 2018).

Participants

Two thousand nine hundred and five members of the Swedish trade union, "The National Union of Teachers" (in Swedish "Lärarnas Riksförbund"), representing eleven different local unions, working in the south and middle part of Sweden received a digitized questionnaire by e-mail. In total, 768 questionnaires (26%) were returned. Participants' mean age was 46.3 (SD = 10.07, range 24–67) and mean employment time within the organization was 14 years (SD = 10.2). Ninety-nine per cent of the participants had an educational function, i.e. they worked as teachers or similar, 92.1% of the participants worked within the municipal sector, 95.2% were in permanent employment, 80.5% had full-time jobs, 68% had university studies as their highest level of education, and 75.5% were female.

Procedure

Chairpersons of eleven municipal associations of the Swedish trade union, "The National Union of Teachers", were contacted and informed of the aim of this project. They were asked to invite their union members to participate in a survey about work-identity and health. Due to Swedish juridical restrictions that do not permit a chairperson of a trade union to distribute individual e-mail addresses of the members outside the union, a web-link to the questionnaire was distributed to the members by the chairpersons during spring 2016. The questionnaires were accompanied by a covering letter that described the purpose of the project and informed the participants that completion of the questionnaire was taken as an indication of their consent to participate in the present project and that this was voluntary, and that confidentiality and anonymity were assured. After completion of the questionnaire, the participants were asked to fill in their name and address if they wanted to receive a cinema ticket as compensation for their participation. They were informed that nobody but the researchers of the present study would have access to their names and addresses. In this study, we analyzed data related to emotion and cognition component of personal- and collective work-identity, general mental health, and exhaustion.

Finally, an ethical application was reviewed and approved by the Swedish regional ethical committee of Uppsala University (Dnr 2015/423).

Measures

Exhaustion. "Karolinska Exhaustion Scale 26" (KES26), developed by Saboonchi et al. (2012) was used as the measure of exhaustion. It contains 26 statements measuring six subscales (cognitive exhaustion, disturbed sleep, excessive fatigue, somatic symptoms, irritability, and negative affect) and the question: "How often have you experienced problems with any of the following issues during the past month?". Responses were made on a five-point Likert scale, defined as: 1 = "never"; 2 = "seldom"; 3 = "sometimes"; 4 = "often"; and 5 = "always". KES26 has shown good psychometric properties and adequate fit for the one-factor model of this measure. The subscales, except for the

subscale of disturbed sleep (consisting of only two items), have shown acceptable internal consistency; primary sample mean α = .76 and cross-validation sample mean α = .82 (Saboonchi et al., 2012). In the present study, the one factor model of exhaustion showed a Cronbach alpha value (α) of .95 indicating very good internal consistency (see DeVellis, 2003).

General Mental Health was measured by a single item related to the question: "How do you rate your mental health at the present?". Responses were made on a three-point Likert scale defined as: 1 = "bad"; 2 = "reasonably satisfactory"; and 3 = "good". The use of a single self-assessment item of general mental health was based on studies showing that self-evaluation of mental health status shows good predicting capability above and beyond the contribution to prediction made by indices based on the presence of health problems. Also, the use of a three-point Likert scale was based on previous results showing that when a GMH scale contains higher number of response categories the extreme categories indicate a low response frequency and thus are redundant (see Idler and Kasl, 1991; Idler and Benyamini, 1997).

Work-identity. Personal work-identity was measured by an instrument suggested by Knez, (2016; see also Knez et al., 2018; Knez and Eliasson, 2017). It includes ten statements measuring emotion and cognition components of personal work-identity: Emotion ("I know my work very well."; I miss it when I'm not there."; "I have strong ties to my work."; "I am proud of my work."; "It is a part of me."); Cognition ("I have had a personal relation with my work over a long period."; "There is a link between my work and my current life."; "I can travel back and forth in time mentally to my work when I think about it."; "I can reflect on the memories of my work"; "My thoughts and memories about my work are part of me."). Participants were asked to respond to the statements on a five-point Likert-scale ranging from 1 (completely disagree) to 5 (completely agree). In the present study, the Cronbach alpha (α) values were .86 for personal work-identity, .75 for emotion- and .84 for cognition component respectively, indicating acceptable-good internal consistency (see DeVellis, 2003). In addition, Nordhall and Knez (2018) reported a construct validity statistics for the personal work-identity construct/measure, showing an acceptable data fit (see Byrne, 2016) of Chi2 = 188.57, df = 28 (p = .000), CFI = .95 and RMSEA = .08.

Collective work-identity was measured with the "Identification with a Psychological Group Scale" (Mael and Tetrick, 1992; Mael and Ashforth, 1992; Riketta, 2005), theoretically grounded in Social Identity Theory (Tajfel and Turner, 1979, 1986) and the Self-Categorization Theory (Hogg and Terry, 2000). This measure includes six statements with a five-point Likert scale, ranging from 1 (completely disagree) to 5 (completely agree). Based on the conceptual model of Knez (2014, 2016) that distinguishes between emotion and cognition components of work-identity (Knez, 2016; Jackson et al., 2006), the following items of the "Identification with a Psychological Group Scale" (Mael and Ashforth, 1992) were categorized as belonging to the emotion component ("When someone criticizes my organization, it feels like a personal insult."; "When someone praises the organization it feels like a personal compliment."; "If a story in the media criticized the organization, I would feel embarrassed.") and cognition component ("I am very interested in what others think about the organization."; "When I talk about this organization, I usually say 'we' rather than 'they'."; "This organizations' successes are my successes.") respectively. This was done in line with Mael and Ashforth's (1992) suggestions (also supported by Tajfel, 1972, 1978; Hogg, 2012). Following Cronbach alphas (α) applies to the different scales: .87 for collective work-identity, .78 for emotion- and .77 for cognition component, indicating good internal consistency (see DeVellis, 2003). As above, Nordhall and Knez (2018) reported an acceptable construct validity data fit (see Byrne, 2016) of Chi2 = 64.09, df = 7 (p = .000), CFI = .97 and RMSEA = .10 for the collective work-identity concept/ measure.

Design and analyses

In line with the two hypotheses (see Introduction), four types of multiple regression analyses were performed in order to investigate the role of emotion- and cognition components of personal- and collective work identity, respectively, in predicting general mental health and exhaustion. Thus, regression analyses including the following predictors and criterion variables were performed:

Hypothesis 1: (a) Emotional- and cognitive personal work-identity (predictors) and general mental health (criterion variable)

(b) Emotional- and cognitive personal work-identity (predictors) and exhaustion (criterion variable)

Hypothesis 2: (a) Emotional- and cognitive collective work identity (predictors) and general mental health (criterion variable)

(b) Emotional- and cognitive collective work identity (predictors) and exhaustion (criterion variable)

In all four analyses, we controlled for the effects of: age; gender (male vs. female); part of full time employment (%); school sector (public vs. private); years of employment; and educational level (low vs. high). These variables have previously been addressed as potential confounders, related to mental health and exhaustion (De Lange et al., 2004; Houkes et al., 2003; Klusmann et al., 2008; Van Den Broeck et al., 2008). In order to specify a fixed order of entry to control for the effects of potential confounders, in the four multiple hierarchical regression analyses, the covariates were entered in step one and predictors in step two.

Results

First, we report the bivariate correlations, N, mean and standard deviation statistics for all variables included in the regression analyses (see Table 1). Second, we report the results for our hypotheses and the types of regression analyses related to each one of the four hypotheses respectively (see section Design and Analyses). None of the statistical analyses below were subjected to multicollinearity effects, showing Tolerance values of $>.10$, range .441–.981 and all VIF (variance inflation factor) <10, range 1.020–2.269 (see Menard, 1995; Myers, 1990; Tabachnick and Fidel, 2012).

Table 1 Bivariate correlations (r), N, mean (M) and standard deviation (SD) statistics for all variables included in the regression analyses: Emotion (E-) and cognition (C-) component of personal work identity

	N	M	SD	1	2	3	4	5	6	7	8	9	10	11
1 E-PWI	767	3.62	.71											
2 C-PWI	767	3.61	.86	.610[b]										
3 E-CWI	767	2.60	.99	.248[b]	.232[b]									
4 C-CWI	767	2.97	.98	.294[b]	.220[b]	.739[b]								
5 GMH	767	2.31	.70	.119[b]	−.119[b]	.040	.082[c]							
6 E	767	2.43	.74	−.131[b]	.150[b]	.001	−.087[c]	−.691[b]						
7 Age	768	46.27	10.07	.041	.005	−.123[b]	−.083[c]	.091[c]	−.060					
8 Gender	768	na.[a]	na.[a]	.205[b]	.111[b]	.107[b]	.061	−.024	.056	−.003				
9 PFTE	768	94.85	12.81	.075[c]	.022	.085[c]	.101[b]	.068	−.054	−.020	−.064			
10 SC	768	na.[a]	na.[a]	−.042	−.018	.016	−.000	−.040	−.000	−.145[b]	−.021	−.084[c]		
11 YE	768	14.00	10.22	.063	.052	−.036	−.055	.075[c]	−.033	.657[b]	.018	.007	−.239[b]	
12 EL	768	na.[a]	na.[a]	−.026	−.076[c]	−.055	−.031	.040	−.039	.064	.082[c]	−.063	.030	.016

a   na. = not applicable due to categorical data.

b   Correlation is significant at the .01 level (2-tailed).

c   Correlation is significant at the .05 level (2-tailed).

Emotion and cognition components of personal work-identity and general mental health and exhaustion
As can be seen in Table 2 (see also Table 4 for the first step regression statistics) emotion and cognition components of personal work identity significantly predicted both general mental health and exhaustion, accounting for 7% and 10% respectively of variance explained by the regression. As expected, emotional personal work identity was shown to positively associate with general mental health (p = .000), and cognitive personal work identity was shown to negatively associate with general mental health (p = .000). Also as predicted, and vice versa to general mental health-results, exhaustion linked negatively to emotional personal work-identity (p = .000) and positively to cognitive personal work identity (p = .000).

Table 2 Relations between emotion- (E-) and cognition (C-) component of personal work-identity (PWI) and General Mental Health (GMH) and Exhaustion (E), respectively after controlling for the six covariates (age, gender, part of full time employment, school sector, years of employment, educational level).

Outcome	R^2 change	Beta (β)	df	F change	t	p
GMH	.07		2. 760	29.01		.000
		.31 E-PWI			6.82	.000
		−.30 C-PWI			−6.82	.000
E	.10		2. 757	43.38		.000
		−.37 E-PWI			−8.33	.000
		.36 C-PWI			8.35	.000

Emotion and cognition components of collective work-identity and general mental health and exhaustion
As shown in Table 3 (see also Table 4 for the first step regression statistics) emotion and cognition components of collective work-identity significantly predicted general mental health and exhaustion accounting for 1% and 2%, respectively, of variance explained by the regression. Cognitive collective work-identity was as predicted, positively related to general mental health (p = .040), while emotional collective work-identity was negatively, although not significantly (p = .574), related to general mental health. Emotional collective work-identity was, on the other hand and as predicted, shown to positively associate with exhaustion (p = .020), and cognitive collective work-identity was, on the opposite, negatively related with exhaustion (p = .001).

Table 3 Relations between emotion- (E-) and cognition (C-) component of collective work-identity (CWI) and General Mental Health (GMH) and Exhaustion (E), respectively after controlling for the six covariates (age, gender, part of full time employment, school sector, years of employment, educational level).

Outcome	R^2 change	Beta (β)	df	F change	t	p
GMH	.01		2. 758	3.01		.050
		−.03 E-CWI			−.56	.574
		.11 C-CWI			2.03	.040
E	.02		2. 757	6.06		.002
		.13 E-CWI			2.37	.020
		−.19 C-CWI			−3.47	.001

Table 4 Statistics for the first step of the hierarchical regression analysis involving six covariates [age, gender, part of full time employment (PFTE), school sector (SC), years of employment (YE), educational level (EL)] and criterion variables of general mental health (GMH) and exhaustion (E). See Tables 2 and 3 for the main (second step) results.

Outcome Step 1	R^2	Beta (β)	df	F	t	p
GMH	.02		6, 760	2.07		.060
		.07 Age			1.53	.130
		−.02 Gender			−.64	.521
		.07 PFTE			1.91	.057
		−.02 SC			−.56	.580
		.02 YE			.43	.666
		.04 EL			1.16	.245
E	.01		6, 759	1.45		.193
		−.06 Age			−1.33	.183
		.06 Gender			1.51	.131
		−.06 PFTE			−1.53	.126
		−.01 SC			−.27	.790
		.01 YE			.15	.883
		−.04 EL			−1.18	.242

Summary
Below we summarize the main results reported in Tables 2 and 3, in four Figures. This was done in order to figuratively illustrate the findings obtained. In line with our hypotheses, it was shown that emotion and cognition components of personal- and collective work-identity symmetrically associated with general mental health and exhaustion.

As can be seen in Fig. 1, the emotion component of personal work-identity (in contrast to the emotion component of collective work-identity), was positively related to general mental health. Logically, these relations were reversed for exhaustion, showing that emotional personal work-identity was negatively- and emotional collective work-identity was positively related to exhaustion (see Fig. 2).
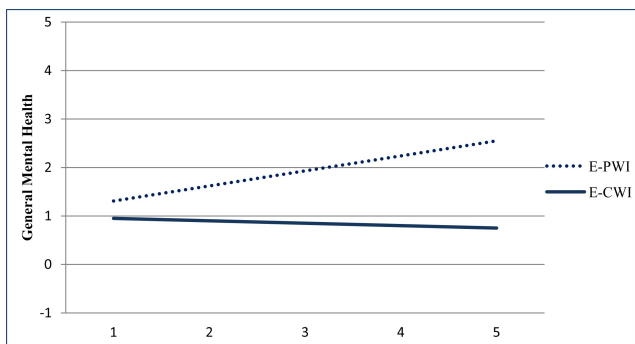
Fig. 1 Relations between emotion (E-) component of personal work-identity (PWI) and collective work-identity (CWI), respectively, and General Mental Health (GMH) after controlling for the six covariates (age, gender, part of full time employment, school sector, years of employment, educational level).
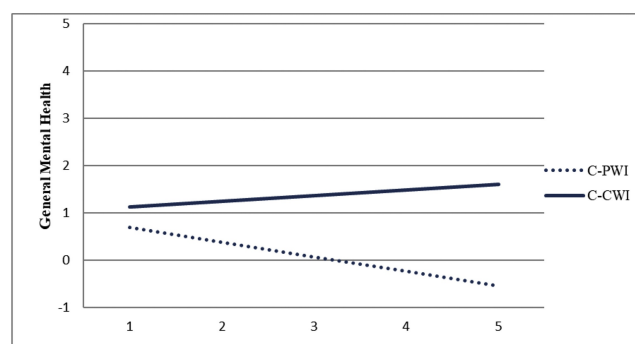

Fig. 3Relations between cognition (C-) component of personal work-identity (PWI) and collective work-identity (CWI), respectively, and General Mental Health (GMH) after controlling for the six covariates (age, gender, part of full time employment, school sector, years of employment, educational level).
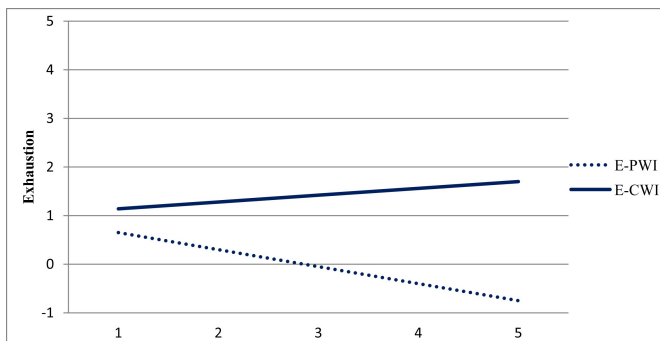

Fig. 2 Relations between emotion (E-) component of personal work-identity (PWI) and collective work-identity (CWI), respectively, and Exhaustion (E) after controlling for the six covariates (age, gender, part of full time employment, school sector, years of employment, educational level).

Fig. 4Relations between cognition (C-) component of personal work-identity (PWI) and collective work-identity (CWI), respectively, and Exhaustion (E) after controlling for the six covariates (age, gender, part of full time employment, school sector, years of employment, educational level).
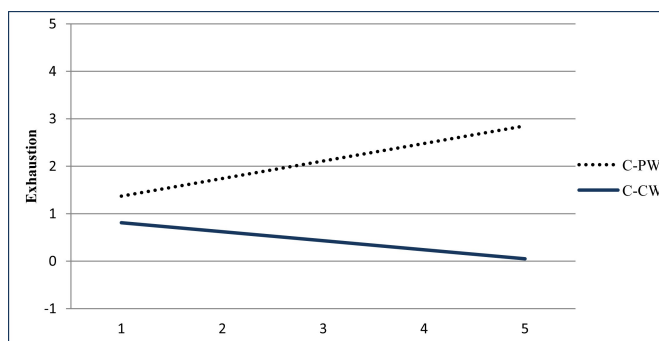
As can be seen in Figs. 3 and 4, the cognition component of personal work-identity and collective work-identity was reversely related to general mental health and exhaustion; also, symmetrically shifting to the emotion component (emotional personal- and collective work identity) relationships with general mental health and exhaustion (compare Figs. 3 and 4 with Figs. 1 and 2 above).

Discussion

The objective of this study was to investigate the relationships between emotion and cognition components of personal- and collective work-identity and self-reported general mental health and exhaustion in teachers, indicating higher prevalence of burnout syndrome compared to other work groups in a Swedish sample (Hallsten et al., 2002). Given that teachers compared to other groups are exposed to psychological demands (Demerouti et al., 2001), in terms of prosocial extra-role interactions with students, colleagues and students' parents (Maslach et al., 2001), makes them

especially sensitive in developing burnout syndrome as a consequence of stress related work-overload (Santavirta et al., 2007; Aloe et al., 2014; Zee and Koomen, 2016).

In line with previous research (e.g., Kremer and Hofman, 1985; Van Dick and Wagner, 2002; Fisherman, 2015; Cohen, 2004; Jetten et al., 2014), we predicted that the emotion component of personal work-identity (Hypothesis 1) and the cognition component of collective work-identity (Hypothesis 2), would associate positively with general mental health and negatively with exhaustion; and that reverse links would yield for the cognition component of personal work-identity (Hypothesis 1) and emotion component of collective work-identity (Hypothesis 2). The results obtained were shown to support these predictions (except for emotional collective work identity which did not relate significantly, although negatively, to general mental health) and are in accordance with previous research indicating, as in the Swedish sample (Hallsten et al., 2002), higher prevalence for psychological distress, such as burnout and exhaustion, in teachers, compared to other employee groups (Hakanen et al., 2006; Aloe et al., 2014).

Accordingly, our results question some of the previous findings suggesting that both personal- and collective work-identity might associate positively with general mental health and negatively with exhaustion (e.g., Edwards and Dirette, 2010; Wegge et al., 2006; Haslam et al., 2009a,b; Jetten et al., 2012; Haslam, 2014; Jetten et al., 2014; Steffens et al., 2016). We showed, namely, that these relationships might be reversed, accounted for by the emotion- and cognition component of personal- and collective work-identity respectively. Moreover, these links were reported to be stronger for emotion and cognition components of personal work-identity compared to emotion and cognition components of collective work-identity.

With regard to Hypothesis 1, it was reported that, when the process of attachment/belongingness/ closeness (emotion component) increases in personal work-identity (Knez, 2016), respondents

report better general mental health (De Lange et al., 2004) and, consistently, lower exhaustion (Saboonchi et al., 2012). This was, however, reversed for the cognitive component of personal work-identity involving processes of coherence, correspondence, mental time, reflection and agency. In view of that, we could say that, when respondents feel more and think less with reference to their personal work-identification they will feel mentally better and will be less exhausted, as tentatively implied by Kremer and Hofman (1985), Van Dick and Wagner (2002), and Fisherman (2015).

Concerning Hypothesis 2, it was shown that, when incorporation, identification and assimilation (cognitive processes of collective work-identity; Mael and Ashforth, 1992; Van Knippenberg and Sleebos, 2006; Nordhall and Knez, 2018) increase, respondents report better general mental health and, soundly, lower exhaustion. Collective work-identity's association with general mental health and exhaustion was, as predicted, reversed for the emotion component. Accordingly, when respondents think more and feel less with reference to their collective work-identification they will feel better and will be less exhausted, as tentatively implied by Jetten et al. (2014), Cruwys et al. (2015) and Greenaway et al. (2015).

In short, a strong emotional component of personal work-identity (Knez, 2016) and a strong cognitive component of collective work-identity (Mael and Ashforth, 1992; Van Knippenberg and Sleebos, 2006; Nordhall and Knez, 2018) appear to provide a psychological asset for the teachers with reference to their general mental health and exhaustion. However, a strong cognitive component (coherence, correspondence, mental time, reflection and agency) of personal work-identity and a strong emotional component of collective work-identity (pride, esteem, and affective commitment; Mael and Ashforth, 1992; Van Knippenberg and Sleebos, 2006; Nordhall and Knez, 2018) seem to be responsible for a disadvantage, for teachers, with reference to their general mental health and exhaustion.

To some extent, these findings correspond to Nordhall and Knez (2018), who showed that a positive association between personal work-identity and self-determined work-motivation (Ryan and Deci, 2000; Gagne and Deci, 2005; Tremblay et al., 2009) was accounted for by the emotion component of personal work-identity. Correspondingly, previous studies have reported a positive link between aspects of work-related motivation and general mental health (see Ryan and Deci, 2000; Van den Broeck et al., 2016; Björklund et al., 2013) and a negative association between aspects of work-related motivation and exhaustion (Hakanen et al., 2006; Björklund et al., 2013). Furthermore, Nordhall and Knez (2018) reported a positive association between collective work-identity and organizational pay-justice (Colquitt, 2001; Colquitt et al., 2013), accounted for by the cognitive component of collective work-identity; hence, indicating a psychological advantage of the cognitive, compared to the emotion, component of collective work-identity as also reported in the present study. Previous research has additionally indicated that different dimensions of organizational justice might relate positively to general mental health (Spell and Arnold, 2007; Robbins et al., 2012; Eib et al., 2014) and negatively associate with exhaustion (Robbins et al., 2012).

Thus, and in line with previous research (e.g., Kremer and Hofman, 1985; Van Dick and Wagner, 2002; Fisherman, 2015; Cohen, 2004; Jetten et al., 2014; Nordhall and Knez, 2018) and Figs. 1, 2, 3, and 4, we might suggest that: (1) Emotion component of personal work-identity and cognition component of collective work-identity will positively associate with psychological wellness at work, including work motivation, organizational justice, and general mental health (see Keyes, 2005; Van den Broeck et al., 2016; Howard et al., 2016); (2) Emotion component of personal work-identity and cognition component of collective work-identity will negatively link with psychological distress at work, such as exhaustion (Saboonchi et al., 2012); and that (3) Reversed relationships between cognition component of personal work-identity and emotion component of collective work-

identity and general mental health and exhaustion will apply.

To sum up, when personal work-identity is involved, the emotion component might be mostly responsible for the magnitude of the psychological wellness associated with different work outcomes (Knez, 2016; Knez et al., 2018; Nordhall and Knez, 2018; Knez and Eliasson, 2017), and by contrast, when collective work-identity is engaged, the cognitive component might be mostly responsible for the magnitude of the psychological wellness associated with different work outcomes (Ashforth and Mael, 1989; Harquail and King, 2003; Corley et al., 2006; Van Knippenberg and Sleebos, 2006; Knez, 2016; Knez et al., 2018; Nordhall and Knez, 2018; Knez and Eliasson, 2017).

Conclusion

In agreement with previous research reporting associations between job characteristics and employees' health (e.g., De Lange et al., 2004; Maslach and Leiter, 2008), we have predicted and shown a significant role of emotion and cognition components of personal- and collective work-identity for the self-reported general mental health and exhaustion in a Swedish teacher sample (N = 768). Overall: When teachers felt more and thought less with reference to their personal work-bonding, they felt mentally better and were less exhausted, and by contrast, when they thought more and felt less with reference to their collective work-bonding, they felt mentally better and were less exhausted. The practical implications of our conclusion is to design interventional programs to promote the advantage of stronger feeling and to reduce the disadvantage of stronger thinking in teachers' personal work bonding, as well as to promote the advantage of stronger thinking and reduce the disadvantage of stronger feeling in their collective work bonding; due to their feelings of mental health and exhaustion [see van Dierendonck et al. (1998) for a similar intervention related to effects of organizational (in)justice on burnout].

Declarations
Author contribution statement

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A Review of the Assessment Tools for the Student-Led Cognitive Outcomes/Contributions in the Sense of Inquiry-based Teaching

Öğrenen-temelli Bilişsel Çıktıların/Katkıların Araştırma-Sorgulama Temelli Öğretim Bağlamında Değerlendirilmesine Yönelik Araçların Derlemesi

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Abstract.

The purpose of this review is to summarise an array of tools both for science teachers and particularly for science teacher educators to reconsider student-led cognitive outcomes that are initiated and maintained within the in-class science inquiry activities. For this purpose, first, the essential characteristics of the inquiry-based teaching are described and Bloomian taxonomies in assessing the student-led outcomes and student-led intellectual contributions to the classroom discourse is interrogated. Based on the multifaceted and social-interactive characteristics of the inquiry-based teaching, four assessment tools are displayed, justified and exemplified for the pedagogical purposes of the science teaching and learning. The assessment tools are gathered from six different groups of scholars' research efforts. As a whole, the tools are able to assess the quantitative-qualitative student-led outcomes, the students' capacities of operating inquiry skills and practices, the students' abilities to attain evidence-based reasoning and the students' capabilities to generate varying degrees of argumentation. Concrete and fictional instances and potential in-class uses of the offered tools are clarified for the science educators and science teachers.

Keywords: Inquiry-based teaching, cognitive outcomes, intellectual contributions

Öz. Bu derlemenin amacı, fen eğitimcileri ve fen öğretmenleri için fene dayalı araştırma-sorgulama süreçlerinde başlatılan ve sürdürülen öğrenen-temelli bilişsel katkıların değerlendirilebilmesini sağlayacak araçları özetlemektir. Bu amaçla öncelikle, araştırma-sorgulama temelli fen öğretiminin temel özellikleri tanımlanmış ve öğrenen-temelli bilişsel çıktı ve katkıların değerlendirilmesi için sunulan Bloomcu taksonomiler sorgulanmıştır. Araştırma-sorgulama temelli öğretimin çok yönlü ve sosyal-etkileşimli yapısı temel alınarak dört farklı değerlendirme aracı sunulmuş, gerekçelendirilmiş ve fen öğrenmenin ve öğretmenin pedagojik amaçları bağlamında örneklendirilmiştir. Değerlendirme araçları, altı farklı araştırma grubunun araştırma-temelli çabaları sonucunda geliştirilmiştir. Sonuç olarak, değerlendirme araçları, öğrenenlerin nicel-yönelimli ve nitel-yönelimli bilişsel katkılarını ve çıktılarını değerlendirme, öğrenenlerin araştırma-sorgulama beceri ve pratiklerini gerçekleştirebilme kapasitelerini değerlendirme, öğrenenlerin delil-temelli akıl yürütme becerilerinin değerlendirilmesi ve öğrenenlerin argüman kurma ve çürütme yönüne kapasitelerinin değerlendirilmesi yönünde etkili bir biçimde kullanılabilir. Değerlendirme araçları ile gerçekleştirilen örnek değerlendirmeler ve sınıf-içi kullanım potansiyelleri fen eğitimcileri ve fen öğretmenleri için somutlaştırılmıştır.

Anahtar Sözcükler: Araştırma-sorgulama temelli öğretim, bilişsel çıktılar, entelektüel katkılar

INTRODUCTION AND PROBLEM STATEMENT

The purpose of this review is to provide an array of tools for science teachers and for the science teacher educators to reconsider the student-led cognitive outcomes in the sense of science inquiry activities. If the inquiry-based teaching has been well proved in augmenting the student-led outcomes in the science classroom (e.g., Akkus, Gunel, & Hand, 2007; Crawford 2000; Furtak et al., 2010; Gunel, 2006), the measurement and evaluation of the student-led outcomes should be attained in a sense that is considerably appropriated for the inquiry-oriented student-led cognitive contributions. To be clear, a learning outcome clarifies the specific statements displaying what students will know, value or be able to do by the end of, for instance, inquiry-based processes (Biggs, 1992; 1993). The student-led cognitive contributions to the inquiry sessions may be the assessable end-products or written forms of student-led perspectives or reflections. As the inquiry-based teaching and learning environments are rather sophisticated and multifaceted, to be assessable and measurable, the analytical or holistic cognitive contributions of students must specify things that can be observed (Collis & Davey, 1986; Panizzon, 2002), that are public, common and shared (Mercer, 2004; 2010), and not activities or states that are only internal to students' own minds (Driscoll & Wood 2007).

In educational research and particularly in the science education, Bloomian taxonomies (e.g., Bloom, Englehart, Furst, Hill, &Krathwohl, 1956) in assessing student-led outcomes have been become salient. One of the close colleagues and contemporaries (David R. Krathwohl) of the Benjamin Bloom defined four overarching features of the taxonomy:
1.   common language about learning goals to facilitate communication across persons, subject matter, and grade levels;
2.   basis for determining for a particular course or curriculum the specific meaning of broad educational goals, such as those found in the currently prevalent national, state, and local standards;
3.   means for determining the congruence of educational objectives, activities, and assessments in a unit, course, or curriculum;
4.   panorama of the range of educational possibilities against which the limited breadth and depth of any particular educational course or curriculum could be contrasted (Krathwohl, 2002, p. 212).

In the Bloomian classification system, there are six categories describing the student-led cognitive outcomes as sequenced consecutively: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom et al. 1956). Bloom and his colleagues (1956) asserted that their classification system can provide substantial tools for operational definitions of the thinking processes of the students in a hierarchical, cumulative and sequential manner within a wide-ranging spectrum (e.g., from a domain to the other, or from a subject or grade level to the other).

Several critics have been raised regarding the Bloomian taxonomy in assessing student-led outcomes, however (Sugrue, 2002), particularly in the context of the science inquiry. Even though the Bloomian taxonomy have been pervasive in the educational field of inquiry over 50 years (e.g. eventually being translated into 22 languages), it has not still been rigorously researched to produce materialistic evidences of its application quality (Sugrue, 2002). As Sugrue (2002) acclaimed that the concrete distinctions have not made between either of the two lowest stages (knowledge or comprehension) or between the four highest stages (application, analysis, synthesis, and evaluation).

The Bloomian taxonomy has also been, therefore, criticised pertaining its narrower dimensionality. To explicate, knowledge and comprehension stages are considered as lower-order thinking skills. Other four stages as application, analysis, synthesis, and evaluation are conceived as the higher-order thinking skills. This splits the taxonomy into two binary dimensions by excluding the gradual cumulation   of   the   student-led   cognitive

contributions.

In response to several criticisms made, Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths and Wittrock (2001) revised the original taxonomy and added a novel dimension entitled as "the knowledge dimension" involving "factual, conceptual, procedural, metacognitive" knowledge. Moreover, the cognitive process dimension was subjected to the changes as "create" stage was added (Anderson et al. 2001). Thus, in the recent form of the taxonomy, there is a move from one dimension (the cognitive process dimension) to two dimensions (including the knowledge dimension).

The so-called unique taxonomy has been still suffering from assessing inquiry-based operations such as making rough inductions, deductions and generating arguments, however. Making rough inductions, deductions and engaging in negotiations and argumentations are inherent to the inquiry-oriented science activities. However, as mentioned, these skills of reasoning may not be truly and thoroughly assessed only by taking the Bloomian taxonomies into account (Ennis, 2002; 2004; 2011; Facione, 1990). In this sense, particularly Robert Ennis raised his concerns regarding the instructional potentials and credibility of the Bloomian taxonomy in assessing the student-led outcomes. For instance, Bloomian taxonomies have limitations when it comes to assessing critical thinking skills (Ennis, 2002; 2004; 2011) as one of the desired aspects of the student-led outcomes. In addition, Ennis (2011) asserted that educators must exceed beyond the Bloom's taxonomy to re-conceive particular abilities and dispositional characteristics of the presumable critical thinkers as the students who are engaged in the science inquiry. As a whole, there should be additional alternatives in assessing student-led cognitive outcomes as addressed, justified and exemplified in the current study.

Second, in the context of assessing student-led cognitive outcomes, there has been an ongoing paradigm war. To explicate, cognitive outcomes has been explored through either process-product paradigm or sociolinguistic paradigm (Brophy &

Good, 1986). Proponents of process-product paradigm consider cognitive outcomes as a function of teacher behaviours (Carlsen, 1991). Regularly, "this is done by constructing a taxonomy of teacher behaviours, counting (or experimentally manipulating and counting) these teacher behaviours over one or more lessons, and then correlating cumulative counts with individual student or pooled-class outcome measures." (Carlsen, 1991, p. 157-158). Thus, within the context of the process-product paradigm, cognitive outcomes (e.g., what students will know, value or be able to do by the end of the inquiry-based alignments) are assessed through nation-wide examinations and their context, contents and embedded curricular objects are predetermined by considering Bloomian-like taxonomies.

Furthermore, sociolinguistic paradigm considers student-led cognitive contributions in a different sense. Sociolinguistic research paradigm regards classrooms' contextual entities through uses of diverse methodological approaches such as conversation analysis and discourse analysis (Mercer, 2004; 2010). To explicate, an assessment of the student-led cognitive outcomes can be attained by taking the in-class teacher-student interactions into account. In a temporal sense, the analytical, fine-grained and in-depth analysis of the discourses created in the science inquiry can be more illustrative to what extent and how the students are able to intellectually contribute to the classroom discursive exchanges and interactions. Thus, process-product paradigm proponents carry out an assessment of the cognitive outcomes out of the classroom as an end-product (Mercer, 2004; 2010). Moreover, the proponents of the sociolinguistic paradigm conduct an assessment of the student-led intellectual contributions in the classroom as a temporal, emerged, shared and created product (Mercer, 2004; 2010).

As Carlsen (1991) asserted, although two distinctive paradigms concern themselves with divergent issues regarding the assessment of the students' cognitive outcomes and contributions, they may inform each other. With this rationale, in

the current study, both paradigms' methodological lenses are used to capture a holistic understanding pertaining the assessment of the student-led cognitive outcomes (process-product paradigm) and intellectual contributions (sociolinguistic paradigm) emerged during science inquiry sessions. To put it differently, out-of-classroom (product) and in-the-classroom (temporal process) applications of the proposed assessment tools are provided for external reader to lead them to make more concrete, valid and holistic assessments of the student-led cognitive outcomes after the inquiry activities (process-product paradigm) and student-led intellectual contributions to the classroom discourse within the inquiry sessions (sociolinguistic paradigm).

Significance of the Study
This review incorporates several aspects ensuring its contributions to the science education. At the outset, this review presents alternative tools for assessing cognitive outcomes/contributions. The Bloomian taxonomy has been a domineering tool, however, this study shows that there may be other respectively more functional and instrumental tools to make assessments of cognitive outcomes. Moreover, this study aimed at making the instructional uses of the proposed tools visible to the external readers by providing concrete or fictional examples. This was needed for concretising each abstracted tool that would be more transparent for the external reader. Beyond, as mentioned earlier, there has been a main tension between the process-product paradigm and sociolinguistic paradigm. This study displays concrete signs and traces how two paradigms' points of views on the cognitive assessment can be merged with together for the sake of more informative assessments of student-led outcomes in the sense of science teaching and learning.

Describing Teaching by Inquiry and Contextualised Student-led Outcomes
In this section, essential characteristics of teaching by inquiry are documented to justify the necessary uses of the alternative assessment tools for the cognitive outcomes and intellectual contributions that are anticipated to be emerged during the science inquiry sessions.

Current national science education reforms stated that teachers should create inquiry-based learning environments by supporting student-led inquiries and interacting with students in the presence of authentic question generation (National Research Council, [NRC], 2012). Science education reform efforts (ACARA, 2013; NGSS Lead States, 2013) have also indicated, among others, two essential parts of science teaching: conducting inquiries in the science classroom and generate science arguments. These two practices are associated with scientific practices referring to the scientists' work and ways of students' learning in science classrooms (NRC, 2012). The common works of students and scientists were set in Framework for K-12 Science Education (NRC, 2012) and incorporate undertaking investigations by collecting, analysing and interpreting data and establishing evidence-based arguments around the inquiries. There are essential features of inquiry classes illuminating which elements of cognitive outcomes should be featured and assessed. The indispensable features are listed and justified in terms of authentic and case-based assessments of cognitive outcomes

(1)   As acknowledged, the student-led voices should also be dominative and contributing for creation of common and shared knowledge (Mercer, 2010) in the sense of teaching through inquiry. Thus, both in a quantitative and qualitative sense, the proportions or frequencies of the student-led voices must be increased, varied and proliferated (Martin & Hand, 2009; McNeill & Pimentel, 2010; Pimentel & McNeill, 2013). Quantitative aspect of cognitive outcomes refers to countable amounts of students' verbal contributions to the inquiry activity (Lefstein, 2008). In an inquiry activity, students may provide short responses that those are pitched at recall; lower-order stages (Chin, 2006; 2007). These short responses can be "Yes", "No", "I agree with you." The short responses of students may take a few seconds to utter (Lefstein, 2008).
Furthermore, not only the quantities, but also the qualities of the student-led voices should be improved through the authentic inquiry-oriented in-

class sessions (Brown, et al. 2010a, 2010b; Furtak et al., 2010; Hardy, et al. 2010; Shemwell & Furtak, 2010). In this sense, students may be able to consider more than one aspect of the concept under negotiation and make relations between being considered aspects for more extended responses, in turn, attain generalizations. Thus, the quantitatively-oriented and qualitatively-oriented cognitive contributions of students should be defined within a measurable or countable manner to reveal the impacts of inquiry-based activities on cognitive outcomes.

(2)   There are many science concepts that are experienced by the students during the inquiry activities. The concepts of scientific inquiry can be best conceptualised, comprehended and transferred to the external contexts by students when they are engaged in operating skills of inquiry (Benedict-Chambers et al. 2017). During a typical inquiry activity, students may operate both hands-on (e.g., theory-laden observation, measurement, comparison, investigation design) and minds-on (explanation, induction, deduction, argumentation) skills (Grimberg & Hand, 2009). For instance, the students may be guided to gather, analyse and interpret data when answering their research questions (Cavagnetto, 2010; Cavagnetto, Hand, & Norton-Meier, 2010; Cavagnetto & Hand, 2012). In a similar vein, students have opportunities to experience several cognitive pathways. They may make observations, measurements and comparisons. They may provide exemplifications of the phenomena under discussion. They may compose analogies and made clarifications to communicate with others. They establish cause-effect relations to propose scientific explanations. They may construct evidence-based explanations derived from their own inquiry. They may make judgements on others' claims, arguments, observation reports and the credibility of the data sources. They also achieve inductive and deductive inferences from the discourse. They also offer newer investigation designs to revise their peers' experimental thinking.

As a whole, when learning science concepts and scientific practices are considered in an isolated manner, science contents can be acquired through rote learning or memorisation (Benedict-Chambers et al. 2017). Thus, it is an imperative for inquiry

sessions in which teachers and students collectively use scientific practices (hands-on) to develop meanings (minds-on) of phenomena. In conclusion, it would be progressive to recommend an assessment tool to make theoretical and practical cognitive outcomes of students to inquiry processes transparent for science teacher and science teacher educator.

(3)   When the students collect and analyse data in an inquiry activity, it is also expected that the students must create their own evidences derived from gathered data (Crawford, 2000; Cavagnetto & Hand, 2012). It is where the reasoning qualities of the student-led utterances come in. In the science education literature, there has been an ongoing controversy in adjusting the interrelations between the data, evidence and reasoning that is attached with the purposes of the current study in recommending an assessment tool for predicting cognitive outcomes.

As aforesaid, in the inquiry activities, the students should be promoted to pose their own research questions, then, collect, analyse and interpret data. Thus, generic inquiry implementations may be carried out in an argument construction sequence as "questions > claims > evidences" (Cavagnetto & Hand, 2012). In other words, in the activities, the students pose researchable questions, then, propose their claims and create their evidences for their hypothetical pre-claims (Crawford, 2000). There are of course alternative triplet cycles (e.g., claim > evidence > reasoning) that put a clear isolation between evidence and reasoning (McNeill, 2009; McNeill & Krajcik, 2008; McNeill, Lizotte, Krajcik, & Marx, 2006).

In the NRC's (2007) Ready Set Science, claim, evidence and reasoning are explained as: Claim: What happened, and why did it happen? Evidence: What information or data support the claim? Reasoning: What justification shows why the data count as evidence to support the claim? (p. 133). This triplet (claim > evidence > reasoning) have supported and applied by many scholars (McNeill, 2009; McNeill & Krajcik, 2008; McNeill, Lizotte, Krajcik, & Marx, 2006; McNeill & Pimentel, 2010; Pimentel & McNeill, 2013). It is clear in the NRC's (2007) documentations that reasoning occurs only at a defined point of the science inquiry processes.

This implies that after collecting appropriate and sufficient evidences, students may be engaged in reasoning processes (McNeill, Lizotte, Krajcik, & Marx, 2006). However, reasoning must be throughout as a critical aspect of entire processes of inquiry activities. As a result, reasoning might be undervalued to some extent if the evidence and reasoning are isolated (Cavagnetto & Hand, 2012).

In aforesaid context, the controversy is that how it is possible to merge with reasoning and evidence. The answer finds itself in the relationship between data and evidence in terms of this study. In this study, data is accepted as the student-led observations and experimental-based recordings. In the inquiry implementation, what is seen and recorded is commonly accepted as being the data obtained from student-led inquiries. However, there should be a question to be asked that how the students would use the data? In a common sense, to our knowledge, the data does not speak. In other words, there must be "a data analysis procedure on the part of the students' to produce original evidences for the posed claims (Cavagnetto, 2010; Cavagnetto & Hand, 2012). Thus, there should be a transformation of data into evidence requiring specific types of reasoning (Cavagnetto & Hand, 2012). This shift is required a cognitive work on the part of the students that is termed as reasoning quality in this study. In other words, as Cavagnetto and Hand (2012) states:

"A student has to analyse and synthesize the data points into some coherent series. There are critical decisions that need to be made such as what to keep, what to discard, and how well the data points are connected. That is, data does not speak and so the learner has to apply some critical thinking and reasoning to be able to make decisions to produce the required evidence he/she needs to make an argument." (p. 46).

In this sense, within the scope of this study, both data and reasoning is conceived as evidence. Thus, it has been an imperative to assess the student-led data collection, analysis and interpretation processes in the context of producing their own evidences in supporting or falsifying prior claims regarding the questions posed.

(4)   Once the students produce their evidence-based claims by pondering on gathered data, it would be time to negotiate the validity and reliability of the generated evidences as in the form of arguments. In inquiry-based implementations, it is more possible and potential to observe that students produce counter-arguments, rebuttals, alternative explanations against to their classmates' claims (Cavagnetto, 2010; Cavagnetto, Hand, & Norton-Meier, 2010; Cavagnetto & Hand, 2012). In this context, teachers should monitor and collide with alternative findings (arguments) and contradictory explanations (arguments). In a specific sense, it is necessary to prompt students for researching into alternative or contrasting research questions to augment the scope of the negotiations of meanings (Soysal & Radmard, 2017; 2018). It is the routine of productive inquiry-based implementations (Cavagnetto & Hand, 2012). To support, as Cavagnetto and Hand (2012) summarized "when procedures are uniform for all students, where data are similar and where claims match expected outcomes, then the reporting of results and conclusions often lacks opportunities for deeper student learning about the topic or for developing scientific reasoning skills." (p. 48). In other words, when science teachers guide students to alternative research questions that are varied in terms of being examined research variables, there would be more counter-arguments and alternative experimental inferences that may be smashed during whole group discussions enhancing the coordination of the data and claim. As a whole, it would be invaluable to assess the student-led arguments' qualities that can be acknowledged as possible cognitive outcomes.

In the summary, four essential aspects of in-class inquiry-based implementations should be taken into consideration both in triggering and maintaining the teaching through inquiry and in assessing the potential cognitive outcomes or intellectual contributions. Thus, four different, but interrelated assessment tools are introduced and exemplified in the sense of above-located characterisations of inquiry-based implementations. In the next section, at the outset, methodological foundations of the study will be presented.

Methodology: Systematic Selection of the Related Studies

In this section, two specific features of the methodology of the current study will be presented and justified. The two prominent specifications are conceptual framework in including and/or excluding the studies that were subjected to a systematic review and procedural framework incorporating technical processes in collecting, analysing and interpreting the selected studies.

Conceptual framework: For a systematic review or locating the studies in favour of hypothetically-based assertions attained in this study, the basic criterion was to clarify "eligibility". Eligibility refers to the theory-laden or intervention-based appropriateness of the selected studies that are thought to be included in a study or which studies will be excluded from the systematic review (Abrami, Cohen &d'Apollonia, 1988). For many systematic and purposeful reviews, the most important question that a researcher should ask herself or himself is to which studies are more potential or eligible in including to the pool of the studies (Gliner, Morgan & Harmon, 2003; Lin, Lin ve Tsai, 2014; Suri & Clarke, 2009). One of the surrounding eligibility criterion can be deduced from operational definitions of concept(s) under examination (Abrami, Cohen and d'Apollonia 1988).

In this study, four featured concepts or themes had framed the researcher's mind to select or exclude a study during retrieving processes. These themes are operationally defined within above section and can be listed as "countable amountsofcognition", "cognitive pathways"; "argument quality" and "reasoning typologies". The inclusion of a study was truly decisioned whether the study gets in touch with any of the predetermined themes. To put it differently, four themes have been accepted as the fundamental characteristics of an inquiry-based in-class process as justified above. As a rational, therefore, a fine-grained griddle was composed to filter the proper studies from the irrelevant or unrelated ones.
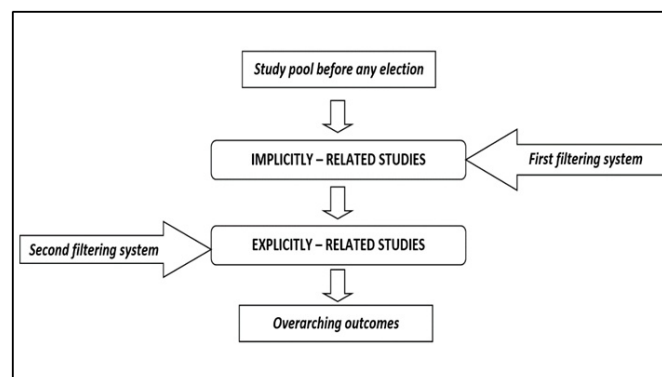

Figure 1. Phases for conceptualising the related studies

In this context, the pooled researches for the current study can be sorted in two classes as "explicitly-related studies" and "implicitly-related studies" (see also Figure 1). Implicitly-related studies provide the conceptual, factual and epistemological tools to comprehend and examine the ways in which students are able to contribute to classroom discourse during inquiry sessions (e.g., Ennis 2002; 2004; Facione 1990). Explicitly-related studies are the selected research to inquiry into in order to determine which types of concrete tools can be used and applied for assessing student-led cognitive contributions and outcomes emerged in science inquiry (e.g., Furtak et al., 2010; Shemwell & Furtak, 2010). In a sense, implicitly-related studies were the predictors and the indicators of the main studies as explicitly-related studies. In "References" section implicitly-related studies are marked by (*) and explicitly-related studies are flagged by (**). Totally, 36 studies ($n_{indirect}$ = 17; n_{direct} =21) were incorporated in this study to establish a broader picture in a thick forest. In a sense, implicitly-related studies guided the researcher for looking into more convenient sources of the tools of identifying student-led cognitive outcomes or contributions. In other words, the conceptualisations embedded in the implicitly-related studies were functionalised as the initial filtering systems for selecting or ignoring the studies (see also Figure 1). Explicitly-related studies therefore the outcomes of the in-depth analysis of more concrete and essential studies devoted to a direct exploration of the cognitive outcomes or intellectual contributions of students

(see also Figure 1).

Procedural framework: This review was involved studies exploring assessment of student-led outcomes in an implicit or explicit manner. Selected studies were mostly comprised a fine-grained analysis of the ways of assessing the cognitive outcomes. Specific procedures were operated for obtaining the most relevant studies. In searching of related studies, computerized data bases and functional digital operators (e.g., ERIC; Boolean Operator) were used to filter out the appropriate studies.

The search was conducted in 2017 through considering specific keywords: "cognition", "attainment", "achievement", "assessment", "evaluation", "inquiry", "outcomes", "intellectual", "contribution", "tool" or other synonyms or related terms were used in a combined, systematic and pragmatist manner. Primary and secondary references were limited to Academic Journals and Extended Reports. The author accounted for the diversity regarding types of the determined Journals to grasp the different scholar-led voices regarding the phenomenon under consideration.

For a systematic sampling of the current research on the assessment of cognitive outcomes, the author strictly took two aspects of the selected studies into account. At first, selected studies should be devoted to improvement the theory of science education. Secondly, the studies were particularly selected by checking a criterion whether they explored any sets of tools for assessing the cognitive outcomes in an explicit manner.

It was also a matter of selection whether the pooled studies incorporated diversifying participants as students who were varying in terms of academic grades such as secondary science classrooms or middle school level. Finally, techniques of analysis of the cognitive outcomes taken by the pooled studies were another criterion. To explicate, some studies extracted cognitive outcomes by analysing episodes in an interpretivist sense and other studies operated (lag) sequential analysis techniques to attain a systematic observation through coding-counting.

The systematic determination of the studies serviced two purposes. Firstly, there was a better sampling of the related studies that were considerably representative as the selected works reflected both past and current streaming of the research on the assessment of the cognitive outcomes. Secondly, the systematic approach was useful in re-categorising the detected assessment tools around newly invited theoretical frames, thus, incorporated a pragmatist approach in determining and analysing an intensifying research area.

Descriptions of the Measurement Tools in the Context of Teaching by Inquiry

In this section, four assessment tools are described and exemplified. The assessment tools are entitled as "The SOLO Taxonomy", "Cognitive Pathways", "Reasoning Typologies" and "Argument Structures". Each assessment tool is devoted to a particular aspect of assessing the cognitive outcomes and contributions.

The SOLO Taxonomy and Student-led Cognitive Contributions

The Structure of Observed Learning Outcomes (SOLO) represents the levels of progressively complex understanding of students through five general stages that are intended to be relevant to all subjects of all disciplines (Biggs & Collis, 1982). In the SOLO, cognitive contributions of students are conceived as an increasing order in number and complexity of connections. Indeed, the SOLO is a hierarchical model and suitable for assessing learning outcomes of different subjects, levels and diverse lengths of assignments (Biggs & Collis, 1982; Chan et al., 2001).

Table 1. The SOLO Taxonomy

Levels of learning stages	Levels of understanding	Descriptions
Stage of Ignorance	Pre-structural	The task is engaged, but the learner is distracted or misled by irrelevant aspects or information; nothing meaningful has been learned.
Stages of surface learning	Uni-structural	The learner focuses on the relevant domain and picks up one aspect to work with; one specific thing has been learned.
	Multi-Structural	The learner picks up more and more relevant or correct features, but does not integrate them; several relevant, independent and meaningful aspects have been learned.
Stages of deeper learning	Relational	The learner now integrates the parts with each other, so that the whole has a coherent structure and meaning; aspects learned are integrated into a structure.
	Extended abstract	The learner now generalizes the structure to take in new and more abstract features, representing a higher mode of operation; aspects learned are generalized to a new domain

The SOLO incorporates three levels of learning stages: level of ignorance, levels of surface learning, and levels of deeper learning (Table 1). The levels of learning stages are characterized by five levels of understanding: pre-structural, uni-structural, multi-structural, relational, extended abstract. Pre-structural stage is indeed outside of the taxonomy as it refers to stage of ignorance (Biggs & Collis, 1982). In pre-structural level, the students present an irrelevant or false utterance [e.g., "The weight is the mass."].

In uni-structural and multi-structural stages, there are true cognitive contributions of students. In these two levels, only quantity of cognitive contributions are more of an issue. To explain, students may cognitively contribute by displaying many aspects of negotiated science concepts. For uni-structural stage, only one aspect of the topic is provided ["Weight is the load."]. For multi-structural stage, students may declare several aspects of the phenomenon ["Weight means multiplying the mass with gravity, I mean 10. That equals the weight. For example, if this is 50 gr; we can learn its weight-newton by multiplying it with 10. But if it is gr, we should first convert it to kg; then multiply it with 10 and learn its newton. We should convert first."]. However, this does not mean an interconnected or related style of the representations of facts. In other words, even though students provide many aspects of the phenomenon, they are liable to talk about the unconnected or isolated parts of it. There is only a quantitative increase in the cognitive contributions of students, but, there is not a qualitative shift.

In the last two levels of the SOLO taxonomy, cognitive contributions are assessed not only from a quantitative sense but also qualities of the contributions are regarded. Last two stages (i.e., relational, extended abstract) assess the abstraction levels of cognitive contributions. For instance, in the relational stage, students provide interconnected ideas. Students make connections between their ideas by presenting them in a cohesive manner instead of an isolated sense [So, we continue to face difficulties. Since there is no fulcrum, our work doesn't get easier like a simple machine! (talks

about his/her own experiments)]. To compare, in the multi-structural level, the students present, for instance, five distinctive pieces of information about force concept. Then, students attain an abstraction by attaching three distinctive parts of the previously presented five aspects into one coherent line of reasoning. There is therefore a qualitative shift in students' cognitive contributions. Because, students are now able to present a coherent utterance by collapsing and reducing several ideas into a generalized one.

For the extended abstract, at the outset, students may make several genuine relations between the proposed ideas. However, this is not adequate for an extended abstract. Actually, students have to attain inductive reasoning requiring enlarged generalizations. It refers that students should move beyond the related conceptions by constructing generalized statements for transcendental contexts ["There can't be a lever without a fulcrum! All levers have a fulcrum. Otherwise how can we lift! We can't lift anything without a fulcrum."]. Put it differently, Potter and Kustra (2012) indicated the way of moving from relational ideas to extended abstracts as "practice with synthesis and evaluation will help students develop greater understanding of relationships between ideas and the reasons things are done a certain way, etc., and as they are forced to use this knowledge in increasingly unfamiliar, varied, situations, their ability to generalize and adapt will grow." (p. 14).

Several researchers confirmed the SOLO's comprehensiveness and objectiveness in terms of assessing, for instance, cognitive contributions (Chick, 1998; Lake, 1999). The SOLO has also been extensively used in many disciplines in assessing cognitive attainments of the students such as in biology, mathematics and language (Chick, 1998; Lake, 1999). Chan et al. (2001) revealed a positive correlation between the SOLO scores and writing styles (language), learning strategies, learning motivations, gained grades, prior academic competences. It signifies that if a student has a better, for instance, writing style or learning strategy, it can be estimated by the SOLO. In the

context of science teaching and learning, particularly Chin (2006; 2007) offered scholars to apply the SOLO in assessing cognitive contributions. Based on the recommendation of Chin (2006; 2007), van Booven (2015) showed the usability and objectiveness of the SOLO in assessing cognitive contributions emerged in inquiry-based activities.

Cognitive Pathways of Student-led Cognitive Contributions
Grimberg and Hand (2009) developed a qualitative analysis method to look through cognitive operations and devised an assessment tool (Appendix-1: Cognitive Pathways). For the purposes of an inquiry-based implementations, this analytical assessment tool (Grimberg & Hand, 2009) is guiding and informative, yet insufficient. As detailed later in this section, there are more enlarged cognitive pathways of the students emerged in their talks while engaging in the inquiry. Thus, other cognitive pathways should be added to the catalogue.

The integration or re-synthesis is the original contribution of the present study to the related theoretical frameworks. The developed codes (analytical cognitive pathways) applied in the study of Grimberg and Hand (2009) are substantially matched with the critical thinking skills defined by Robert Ennis (Ennis, 2002; 2004; 2011; Appendix-2) and described by Peter A. Facione(Facione, 1990's Delphi Report; see also Appendix-3). This therefore leaded the author to re-embrace critical thinking skills (CTS) in the sense of teaching by inquiry to make the scope of the catalogue more comprehensible for the purposes extended inquiry-based implementations.

CTS, stated in two jurisdictions' executive documentations (Ennis, 2011; Facione, 1990's Delphi Report), were embedded in the initial catalogue of Grimberg and Hand (2009). Ennis (2011) originally defined 12 characteristics of CTS and collapsed them into five higher-order categories (Appendix-2). These categories are Basic Clarification (e.g., ask and answer clarification and/

or challenge questions); Decision-Making (e.g., judge the credibilityof a source); Inference (e.g., make material inferencesasrough induction); Advanced Clarification (e.g., making operational definitions to clarify the meaning); Supposition and Integration (e.g., self-examination; self-correction). Ennis's (2011) revised catalogue of CTS is the result of an ongoing research.

In a similar vein, Facione (1990) revealed the sub-skills and main skills of CTS within a Delphi study. These are Interpretation (e.g., categorization, decoding significance, clarifying meaning); Analysis (e.g., examining ideas, identifying arguments, analyzing arguments); Evaluation (e.g., assessing claims, assessing arguments); Inference (e.g., querying evidence, conjecturing alternatives, drawing conclusions); Explanation (e.g., stating results, justifying procedures, presenting arguments); Self-regulation (e.g., self-examination, self-correction). The author, therefore, deduced that three portrayals of cognitive pathways (Ennis, 2011; Facione, 1990; Grimberg & Hand, 2009) could be combined for a more pragmatist and systematic examination of cognitive contributions. Grimberg and Hand's (2009) assessment tool provides inquiry-related cognitive pathways as in the form of hands-on and minds-on practices. Ennis' (2011) and Facione's (1990) assessment tools allow to expand the embedded aspects of Grimberg and Hand's (2009) assessment tool.

Table 2. Cognitive Pathways of Student-led Responses

Cognitive Pathways	Analytical Codes	Indicators
Perception	Observation	Stating/sharing experienced-based, practical-based or individual-based simple observations, personal experiences, or data that result from students' observations
	Exemplifying	Introducing relevant examples, instances, samples, trials of events, concepts of content under discussion; sharing/stating variables effecting other variables
	Measurement	Reference to any quantitative aspect of the data, stating proportions, making simple calculations by using observed or gathered quantitative data
	Compare	Reference to common/different characteristics of two or more pieces of data or objects; comparing two events/situations/sayings/measurements
Conception	Analogy	Mapping elements from a source domain (well-understood situation) into a target domain (non-familiar situation)
	Basic clarification (low level interpretation)	Questions that stimulate clarification supporting other operations; pieces of knowledge and information that stimulate clarification supporting other explanations/sayings/arguments/opinions/positions/ideas, etc.; decoding significance; simply clarifying meaning within discourse
	Advanced clarification (high level interpretation)	Define/redefine terms, concepts, definitions by using appropriate criteria, examples, instances, samples; making operational definitions to clarify the meaning, arguments, sayings, claims, assertions, etc.
	Cause/effect	Identification of a cause and its effect
Abstraction	Explanation	Offering unproved inference without data/evidence; interpreting/stating/inferring from data-based results, interpreting/stating evidence-based results; justifying procedures (e.g. experimental); justifying experimental/observational data
	Judgement by...	Assessing claims, assessing arguments; judge observation reports; judge the credibility of a source; examining ideas; judge deduction; judge definitions
	Inference-I: induction	Reasoning that links few examples to general premises; make material and generalized inferences (roughly "induction")
	Inference-II: deduction	Reasoning that links general premises to a specific; deduce
	Investigation design	Planning new experiments; stating new ways of investigating/representing/solving a problem/situation; stating new ways of collecting, analyzing and interpreting data
Dispositions	Supposition	Consider and reason from premises, reasons, assumptions, positions, and other propositions with which they disagree or about which they are in doubt, without letting the disagreement or doubt interfere with their thinking
	Integration	Integrate the dispositions and other abilities in making and defending a decision
	Self-regulation	Self-examination; self-correction

As an important note, Grimberg and Hand (2009) also advanced three higher-order categories to sort out cognitive contributions: perception, conception, abstraction. The perception category incorporates lower-order cognitive processes as observation ["I saw that the heavier object and lighter object hit the ground at the same time"], measurement ["There are about fifty-five millimetres distance between the objects".], compare ["Their shapes are different"] and exemplifying ["For instance, lever is a simple machine"]. In this stage, students' cognitive contributions are conceived at the level of sensations.

In the conception level, students may be able to conceptualize and particularly clarify their meanings through their vocabularies. Therefore, basic clarification ["There is light in the room. We can see each other, otherwise we couldn't."]and advanced clarifications ["The light both reverberating and dispersing; and at the same time some of it is being absorbed."] are the most featured elements of this stage.

Lastly, in abstraction stage, students are able to make evidence-based explanations, attain inductive reasoning["We fixed weights of 100 gr to both of them, and when we released them like this (as there is space between them) they stayed like this, there was no change. We tried by increasing the weight little by little (showing the weights in his/her hand). I mean we increased their energy, potential energy. In no way it showed a difference. We measured one by one. We concluded that potential energy cannot be transferred on reels"] anddeductive reasoning, or to offer more technical investigation designs for others' experimental procedures ["No, in fact there is gravity, but at the same level (s/he means because the forces or weights are equal) so we don't feel it… I mean there is not much difference of height between them, may be because of that they didn't move… Maybe it would change if we could try for infinitely times. If I had the chance to try, I would try like that."]. In other words, students exceed scopes of conceptions being negotiated during inquiry-based implementation by making evidence-based scientific explanations. In addition, as barrowed from particularly Ennis (2011), another category was added as critical thinking dispositions that can be seen in the bottom of Table 2; supposition, integration and self-regulation ["I shifted my idea, because later I thought that it desolates when we put salt in water, and according to my friends…"]. These are necessary as surrounding critical thinking dispositions that scaffold the occurrences of CTS (Ennis, 1996).

Reasoning Quality of the Student-led Cognitive Contributions
In a typical inquiry-based implementation, it is imperative for students to reason about gathered data to transform them into evidences. Only collected data do not speak up anything about natural phenomena as students should study on the data to generate evidences. When students ponder about data to empower their arguments, they change the data into evidences. Aforesaid, data plus reasoning ensures evidence. In an in-class inquiry, students should compose researchable questions, make assertions for their questions and generate evidences for their claims. As a rational, a coding

catalogue should be incorporated abovementioned skills of inquiry-based implementations.

In a specific issue of Educational Assessment Journal, Brown and her colleagues (Brown et al., 2010a, 2010b; Furtak et al., 2010; Hardy et al., 2010; Shemwell & Furtak, 2010) made an array of publications. They presented research-based applications of an ongoing research and Evidence-Based Reasoning Video Framework (EBR Video Framework) was one of the most important production of these efforts (Furtak et al., 2010). They offered an alternative way of thinking about reasoning particularly for classroom discourses within the inquiry class. They also proposed a tool to map out the classroom talk (Brown et al., 2010a, 2010b). This mapping out system elucidates reasoning phenomenon within a data plus reasoning is equal to evidence argument that is relevant for the instructional context and epistemological posture of inquiry-based activities (Brown et al., 2010a, 2010b; Furtak et al., 2010; Hardy et al., 2010; Shemwell & Furtak, 2010).

To compose EBR Video Framework (Furtak et al., 2010), data was collected from the elementary and middle school students' whole-class discussions during inquiry-based teaching about concept of sinking and floating. Sinking-floating is a conceptually challenging science phenomenon for the students. Furtak et al. (2010) indicated the functions of the EBR Video Framework as it "captures teachers' and students' co-constructed reasoning about science phenomena and the quality of the backing for those claims. The EBR-Discourse framework conceptualizes reasoning along a continuum, where the most sophisticated science discourse is conceptualized to consist of claims about science phenomena that are supported by a generalized statement about relationships between properties (a rule). In addition to this statement of a rule, (empirical) backing such as reference to observations (data) or summaries of that data (evidence) may be used to support the claim. The least sophisticated reasoning is considered to consist of a single claim or claims without any form of support." (p. 182).

The EBR Video Framework comprises three sets of codes. The first is the quality of reasoning that accounts for "the extent to which claims are backed up with data, evidence, and rules" (Furtak, et al., 2010, p. 182) by students. The other two categories are teacher's contribution and conceptual level. Only first set of the codes are dedicated to cognitive contributions labelled as unsupported, phenomenological, relational, and rule-based (Table 3).

Table 3. Reasoning Typologies of Student-led Responses

Quality of Reasoning	Label	Description
Unsupported	No reasoning	Elements of reasoning present, but no processes of reasoning; pseudo, circular, or tautological reasoning
Phenomenological	Data-based reasoning	Data applied to a claim: Partial reasoning structures rely on data or evidence only. Those structures that reference only data or specific phenomena (phenomenological reasoning) as backing for a claim rely on single observations by students
Relational	Evidence-based reasoning	Evidence applied to a claim, including analysis of data in the form of comparisons between properties or summaries of data
Rule-based	Inductive or deductive rule-based reasoning	1. Deductive reasoning (top-down), applying a rule to make a claim with respect to a new premise 2. Inductive reasoning from data to rule 3. Applying a rule with new evidence (exemplifying with analogy) 4. Complete reasoning structure (whole framework)

Unsupported reasoning specifies that there is no reasoning in student-led utterances. This clarifies the least sophisticated cognitive contribution. Unsupported reasoning includes single claim(s) without any backing. Additionally, claims with no reasoning may also include circular and tautological statements ["I do not agree with you, because you're wrong"]. Partial reasoning structures become visible in phenomenological reasoning. In phenomenological reasoning, students present some sets of data, but they have no idea (reasoning) about why proposed data support their claim(s) ["That is because of pressure. It happens when you hold one side of it. If you take your hand from that side of the pipe, it will disappear too (meaning the slope)."]. In other words, Furtak et al. (2010) explained data-based or phenomenologicalreasoning structures that "rely on data or evidence only. Those structures that reference only data or specific phenomena (phenomenological reasoning) as backing for a claim rely on single observations by students (e.g., the rock sinks because I saw it sink) or single properties (e.g., the rock sinks because it's

heavy).” (p. 185).

Relational reasoning is rather complex compare to former categories. In relational reasoning, students' claims are backed up by evidence(s). The students are now able to apply evidence(s) to claim(s). They are also able to reason about why evidence(s) support or are against their hypothetical claim(s) [“Because you are stretching your arm and the distance is expanding that way. We are implementing more force, it causes more pressure than the other one; as a result, your arm aches.”]. In the top level, rule-based reasoning requires students to make inductive and/or deductive reasoning by collecting a substantial amount of data and transforming them into evidences allowing generalizations that may be supported by scientific principles. Hereby, students are able to apply a scientific principle or a rule that was previously found in their data to other fields[“I think in this way you are losing power but gaining from the distance. Because (bending the arm) we use less force, but as we see we move our arm less. However, when we stretch our arm we use more force and move our arm more. This arm always works like this. I mean, it is the same as levers. When it is close to that thing (meaning the fulcrum), you can't lift up your friend.”].

Argument Structures of the Student-led Cognitive Contributions

During inquiry-based implementations, students are involved in investigative activities in which they generate their own arguments through data collection, analysis and interpretation processes. In these processes, students may criticize and judge others' claims, questions and evidences. They may respond their peers through their own claims, warrants, backings, rebuttals and attain this in specific subjects as qualifiers.

Thus, an alternative analysis of cognitive contributions can be conducted by detecting argument structures of students. This analysis can be achieved through Argument Structure catalogue (Table 4). For this purpose, a relevant analytical

framework can be Toulmin's (1958) argument model (Toulmin Argument Pattern; TAP; Erduran et al., 2004; Simon et al., 2006). TAP has been used as a basis in characterizing argument structure, for instance, in the sense of classroom talk. It also has been treated as a systematic scheme to derive research-based assessmenttools for analyzing argument structures of students that can be qualified as a cognitive contribution to contents taken in inquiry classes (Jimenez-Alexiandre & Erduran, 2008; Erduran et al. 2004; Simon et al. 2006; Soysal, 2012).

TAP originally incorporates six components of a completed argument (Toulmin, 1958) displayed in Figure 2. These are claim, data, warrant, qualifier, backing and rebuttal. A claim is an assertion about what exists, or the values people hold. Based on the TAP, claims remark a statement about a specific outcome. It can be a prediction of a student regarding what will be happening in the future (e.g. “In an inclined plane, heavier masses will reach the bottom first”). A claim can also be an observation of what was happened in the past (e.g., “In our inclined plane, the heavier one reached the bottom first”). A claim can also be a conclusion of what happens in the present (e.g., “The heavier always reach the first in an inclined plane”).

Within TAP, data is described as statements that are used as evidence to support claims. Data component normally incorporates students' recorded observations/measurements. In inquiry-based implementations, data may come from other sources, for instance, everyday experiences of students. Data can be conceived as it “would be generally observed in a science classroom, the premise often identifies an object and a relevant feature or property” (Brown et al. 2010; p. 132).
Toulmin (1958) identified warrants as statements that explicate relationships and coordination between data and claim. Warrants may be matched with evidences. A warrant attaches to claim that is already backed up by reference to a contextualized relationship between two properties, a property and a consequence of that property, or a specific finding (Brown et al., 2010a; 2010b; Furtak et al., 2010;

Hardy et al., 2010; Shemwell & Furtak, 2010).

A qualifier purports conditions in which claim can be more feasible (Toulmin, 1958). Qualifiers are the statements illuminating the proper characteristics of the condition in which the claim is posed. A qualifier "is the given information from whence the claim is derived upon. Includes: object, state of an object, general expression ("subject of reasoning"), point of reference" (Furtak et al., 2010, p. 184).

Backings are the underlying assumptions for data-claim coordination that may be presented explicitly or implicitly within an argument (Toulmin, 1958). A backing can be taken as a secondary warrant reinforcing main justification of the claim (Erduran et al. 2004; Simon et al. 2006). Rebuttals are expounded as statements consisting contradictions to data, warrant, backing or qualifier of an argument. In inquiry-based implementations, students are given opportunities to generate counter evidences against to others' arguments. Students are also engaged in the judgement processes of others' data, warrant, backing or qualifier.
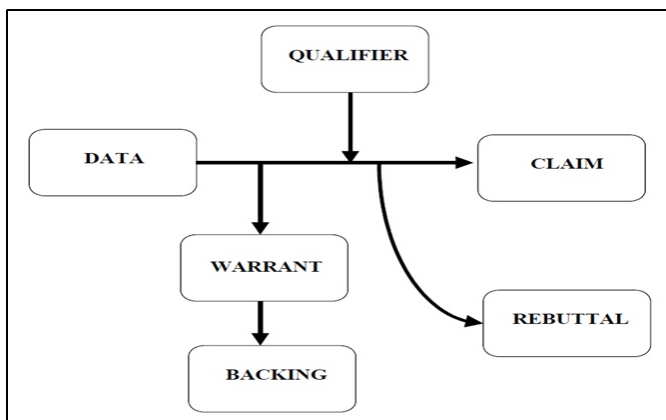
*Modified from Toulmin (1958); The Uses of Argument

Figure 2. Toulmin Argument Pattern*

Based on the TAP, a hierarchical argument structure assessment criterion was composed (Table 4). By considering the complexity of an argument, four levels of the argument structures were established in the context of this study.

Table 4. Argument Structures of the Student-based Responses

Levels of argument structure	Descriptions	Diagrammatic representations
LEVEL-1	Only consisting a claim component (C)	C-
LEVEL-2	Consisting of backing (B) or data (D) in addition to a given claim	C-D C-B
LEVEL-3	Consisting of at the least a warrant/justification (W) for a given claim	C-W C-D-W C-D-W-B
LEVEL-4	Consisting of rebuttal(s) (R) against to others claim, warrant, and backing.	C-D:R C-W:R C-D-W:R C-D-W-B:R

Level-1 argument structure incorporates only claim component that is not justified or warranted. Level-1 argument structure is the simplistic one among other levels. In this level, students may propose their subjective or unsupported ideas ["A sledgehammer makes things more difficult; but we use it."].

Level-2 argument structure may include data or backing in addition to claim, but, it is still lacking warrants or claim-based justifications. In this level of argument, students may be able to provide some observational data for their claims; however, they still do not coordinate their claims with data. Students are not able to explicate why data supports their claims in specific contexts ["For example a sledgehammer. It is a heavy thing, and we have to use more power lift and hit with it."].

Level-3 argument structures include at the least a warrant or justification. In this level of argument, students can associate claims with data through displaying a cognitive work. ["In my opinion, yes. With the bat (racket) we can hit the ball to the further. I can't do that with bare hands. And this proves that it is a simple machine."]

Level-4 argument structure incorporates rebuttals to others' claim, data, backing, justification or warrant as the most complex argument structure ["We can imagine something like this. We can't cut a bone with a small knife; we use something bigger to cut into pieces (the bone-in meat). But for the second situation, we need more power. It may make things difficult at the beginning, however it enables us to complete our task."].

In this manner, a rebuttal may be expressed in utterances that can be fragmented into other components of an argument ([Claim+Data+Warrrant]: Rebuttal; CDW: R). In the context of this study, it is acknowledged as a theory-laden sense (Erduran, Simon & Osborne, 2004; Toulmin, 1958) that rebuttals must also be clarified as higher-level arguments including other additional components of an argument instead of just saying that "I do not agree with you". A similar analytical component analysis was exhibited by Simon, Erduran and Osborne (2006).

CONCLUSIONS ANDRECOMMENDATIONS

Six different research groups' ongoing research endeavours (The SOLO taxonomy: [(i)John Biggs and his colleagues (e.g., Biggs & Collis, 1982)]; Cognitive Pathways: [(ii)Robert Ennis, (iii)Peter A. Facione; (iv)Bruna I. Grimberg and Brian Hand (e.g., Ennis, 2011; Facione, 1990; Grimberg & Hand, 2009)]; Reasoning Typologies: [(v)Erin Marie Furtak and her colleagues (e.g., Furtak, Hardy, Beinbrech, Shavelson&Shemwell, 2010)]; Argument Structures: [(vi)Shirley Simon and her colleagues (e.g., Simon, Erduran & Osborne, 2006)]) were reviewed in the previous sections to represent a representation of the assessment tools for cognitive outcomes at the end of the inquiry processes and cognitive contributions to discursive interactions over the course of the inquiry-based processes. Based on the collective efforts of the scholars in this field, two suggestions are proposed for further research aims of science teacher educators.

First, the proposed assessment tools can be effectively applied for in-class interactions' and exchanges' verbatim transcripts' analysis. Concrete examples of the in-class uses of the proposed assessment tools were provided as the above-located excerpts. As mentioned earlier, this side of the analysis signals the in-the-classroom analysis procedures incorporating the principles of the sociolinguistic paradigm. Furthermore, for a more holistic and combined manner, the proposed assessment tools can be applied to student-led assignments, written reflections, selected inquiry-based works (e.g. questions, experimental designs from the students' product files), graphical representations or other multi-modal clarifications, longer essays on the inquiry-based activities or for the assessment of the open-ended, conceptual exam questions. To our knowledge, these can be considered as the end-products of the inquiry processes within the principles of the process-product paradigm.

Secondly, for establishing more concrete validity and reliability mechanisms for the assessment procedures, the offered assessments tools can be applied in a combined manner. To support, most of the tools incorporate perception, conception and abstraction stages of cognitive outcomes. The perception stage attaches to "data collection procedures", the conception stage associates with "data analysis-interpretation procedures", and abstraction stage relates to the "generalisation" displaying a wholistic representation of an inquiry-based implementation. In a common sense, most of the offered tools (e.g., the SOLO taxonomy, Cognitive Pathways, Reasoning Quality) requires generalised arguments (Argument Structures) that can be beyond the phenomenon and its related aspects that are gained during the inquiry processes. As a whole, end-scores on an assessment tool (the SOLO Taxonomy) can predict, confirm and validate the alternative end-scores that are created by other offered tools (Cognitive Pathways, Reasoning Quality).

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