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The relationship between learning styles and motivation to transfer of learning in a vocational training programme☆

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ABSTRACT

Although there is ample research about Kolb's learning styles, few studies have examined their relationship with motivations to transfer, a concept used to assess whether the content and competencies learned through professional training activities are transferred to the workplace context. Ninety-six students ($M = 24.58$ years old; 99% males) from three vocational training institutes participated in laboratory activities at the Renewable Energy Research Institute of the University of Castilla-La Mancha, Spain. They completed a self-administered questionnaire that included the Kolb's Learning Styles Inventory; two scales adapted to measure student motivation to transfer their learning from training experiences; and a scale of satisfaction with the activities. A correlation analysis showed positive and moderately strong correlations ($r = .708$; $p < .01$) between motivations to transfer and "the relevance of the activities to academic performance". A discriminant analysis between transfer and learning styles revealed that the "Student training motivation" item resulted in a distinct difference between assimilators and convergers, explaining 97.1% of the model variance (Wilks' $\lambda = .459$; $\chi^2 = 21.028$; Sig. = .002) and classifying 56.4% of the cases. A discussion is presented as to the implications of these results for the theory of learning styles and the ways in which the design of the educational activities described in the study can be improved.

☆ This research is part of a teaching collaboration between the Renewable Energy Research Institute of University of Castilla-La Mancha (UCLM) and three vocational training institutes in Castilla-La Mancha, in association with the teaching innovation projects sponsored by UCLM Energy and Environment Science and Technology Campus (Campus Científico y Tecnológico de la Energía y el Medioambiente, CYTEMA).

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Relación entre estilos de aprendizaje y motivación para transferir aprendizajes en formación profesional

Palabras clave:
Estilos de aprendizaje
Motivación para transferir
Formación profesional

RESUMEN

Aunque abundan investigaciones sobre los estilos de aprendizaje de Kolb, escasean estudios sobre su relación con la motivación para el transfer, un concepto utilizado para evaluar la transferencia de contenidos y competencias adquiridas en actividades de formación al contexto laboral. Noventa y seis estudiantes (M = 24.58 años de edad; el 99% varones) de 3 institutos de formación profesional participaron en actividades de laboratorio en el Instituto de Energías Renovables de la Universidad de Castilla-La Mancha, España. Completaron un cuestionario autoadministrado que incluía el Inventario de Estilos de Aprendizaje de Kolb; 2 escalas adaptadas para medir la motivación para el transfer de los estudiantes; y una escala de satisfacción con las actividades. Se observan correlaciones positivas y moderadamente fuertes (r = .708; $p < .01$) entre el transfer y la «valoración de la utilidad de las prácticas para sus actividades académicas». Un análisis discriminante entre el transfer y los estilos de aprendizaje reveló que «la motivación de los estudiantes» diferencia claramente entre asimiladores y convergentes; lo que explica el 97.1% de la varianza modelo (Wilks $\lambda = .459$; $\chi 2 = 21.028$; Sig. = .002) y una clasificación del 56.4% de los casos. Se discuten las implicaciones para la teoría de los estilos de aprendizaje y las mejoras en el diseño de este tipo de actividades.

Learning styles and education

The changes implemented to improve higher education instruction include the shift from a teacher-focused paradigm to a student-focused one. The student-focused classroom was once a more theoretical than practical concept (Biggs, 2003; Morales, 2006; Yániz, 2006), and as such, educators need concepts, theories and strategies that will help them make the pedagogical transition.

The learning styles proposed by David Kolb (1976) offer a previously validated theoretical-conceptual model that is particularly useful for understanding students' motives and learning needs. A student's learning style is determined using the Learning Style Inventory (LSI); this a successful scale that has been widely applied and validated in many studies (e.g., Beutell & Kressel, 1984; Boyatzis & Kolb, 1991; Chen & Chiou, 2012; Cornwell & Manfredo, 1994; Garner, 2000; Healey & Jenkins, 2000; Kolb & Kolb, 2005, 2012; Manolis, Burns, Assudani, & Chinta, 2013; Richardson, 2011; Williams, Brown, & Etherington, 2013; Yeboah & Sarpong, 2012).

The theory proposes a method for describing how students solve problems and apply new knowledge from personal experience within their learning environment. It considers the psychological processes of perception and processing. Students' experiences are classified along two axes; one whose poles represent *concrete experience* and *abstract conceptualisation* and another that represents a continuum between *active experimentation* and *reflexive observation*. The combined scores on each axis indicate which of the four categories of learning styles best describes the student (Fig. 1).

Each style describes a type of learning behaviour. The *divergent* style describes students that primarily engage in concrete

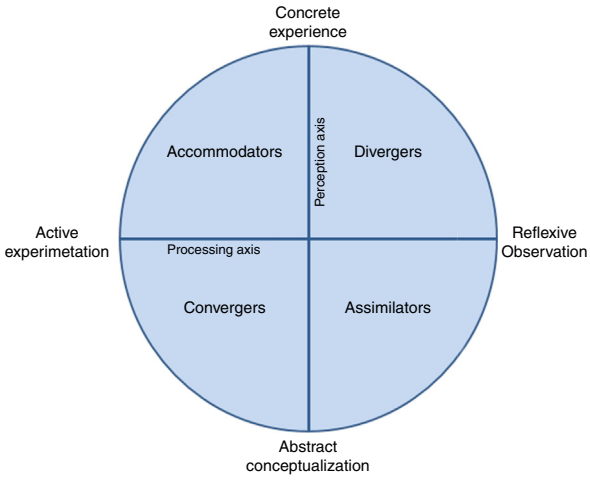

Fig. 1 – Quadrant Model of Kolb's Learning Styles (own elaboration from theory).

thinking and process information reflectively. Such students are committed to learning activities and trust their intuition. In contrast, students belonging to the *convergent* style prefer abstract thinking and active processing and are motivated to discover the practical utility of the learning material. Assimilators combine abstract thinking and reflective processing, preferring to learn in stages. These students are able to comprehend a substantial amount of information because they can easily and systematically organise it. Accommodators, however, combine concrete thinking and active processing. They are more involved in activities because they enjoy taking more risks with their learning experiences and testing

new ideas. Learning styles can change over time because they adapt to changing circumstances and new cognitive experiences. However, these concepts can provide information about students' skills and learning abilities, thereby allowing for optimisation of the effectiveness of teaching activities.

Kolb's learning style concept is a holistic theory designed to assess individual dispositions towards learning. It is useful in a variety of academic specialities, fields and levels. Personality type, vocational preferences, educational training, cultural experience, and other variables can influence this disposition (Kolb & Kolb, 2005). Research has shown that the assessment of learning styles can help educators develop teaching strategies (Healey & Jenkins, 2000; Tulbure, 2011, 2012) and can be used to maximise the efficacy of experiential group activities (Chavan, 2011). In the organisational context, it has also been observed that learning styles could help to understand organisational behaviours, such as employees' confidence (Yamazaki, 2012), managers personality characteristics (Li & Armstrong, 2015), or communication apprehension (Russ, 2012).

Transfer of training

The application of knowledge learned in training programmes within the workplace setting is known as *transfer* (Broad & Newstrom, 2000; Kirkpatrick & Kirkpatrick, 2007). This concept was developed to assess continuous professional training programmes and evaluates whether training materials and skills are applied in the workplace, especially whether workers can effectively and regularly use the knowledge, skills and attitudes learned upon returning to work and even in their personal lives (Broad & Newstrom, 2000; Carpintero, 2002).

Despite an increasing concern of improvement of vocational training programmes and their challenges to teach and assess the knowledge learned (OECD, 2010), the traditional system of evaluation in formal training differs from the concepts and devices available in continuous professional development programmes. This difference can be attributed to the traditional processes of institutional assessment in vocational and higher education and the emphasis on transference in continuous training, which, unlike formal training, focuses on applying the knowledge learned through training within the workplace context (Pérez & Rodríguez, 2002).

Transfer saves a significant amount of time and energy because it facilitates the application of knowledge and skills learned in an academic setting to similar situations in the workplace. Prieto (1994) uses the term "wet powder" to refer to the knowledge and skills that a worker has been taught but has not learned how to transfer. Once knowledge and skills have been acquired, workers many encounter obstacles to implementation such as an unfavourable organisational climate or a lack of the tools needed to test their new skills and abilities (Broad & Newstrom, 2000; Holton, Bates, & Ruona, 2000; Prieto, 1994).

Although there are many models and assessment tools available to assess training programmes, studies about transfer are scarce because performing follow-up evaluations in the workplace after employees have completed a training course is complex and expensive. Though alternative methods based on questionnaires have been developed to assess workers' motivation to transfer knowledge learned in training to the workplace (e.g., Biencinto, 2004), these methods are as scarce as studies of transfer of training.

There are some scales proposed to measure transfer (e.g., Feixas et al., 2013; Holton et al., 2000; Holton, Bates, Seyler, & Carvalho, 1997; Pineda & Quesada, 2013; Roullier & Goldstein, 1993) composed by different amount of items and conceptual dimensions. Ballesteros (2008) and Maya and Olivos (2012); Maya, Olivos, and Prieto (2016) which propose shorter and conceptually complex operationalization of transfer, as applied in the Spanish context, which has shown good reliability proprieties.

This study has the main objective of describing the relationship between students' learning styles and their motivation to engage their transfer of learning, as a better training assessment than satisfaction with the learning activities.

Methodology

Participants

The participants comprised 96 students from three vocational training institutes in Castilla-La Mancha: IES Cencibel (42%), IES Juan Bosco (28%), and CIFP Aguas Nuevas (30%). The students participated in a series of laboratory practicums on renewable energy sources implemented by the Renewable Energy Research Institute of the University of Castilla-La Mancha, Spain. The average age was 24.58 ($SD = 5.7$), and the sample was almost exclusively male (99%). Students from CIFP Aguas Nuevas only participated in the second version of the programme. It could be considered a convenient-intentioned sample selection processes, because we are interested in assessing a specific training programme with all their participants.

Instruments and procedures

Two teaching innovation projects were carried out over two consecutive years at UCLM with the support of CYTEMA (Technological Campus of Energy and the Environment). Each year, the participants were involved in a series of laboratory practicums on renewable energy sources, which included a visit to a specialised company in the renewable energy sector, Renovalia Energy.

A theory session was delivered to all of the practicum participants. This session introduced the basic principles needed to understand the activities included in the practicum.

In laboratory practice, students tested a variety of specialised equipment employed by companies in the renewable energy sector. They experimented with equipment designed to measure wind resources, both traditional systems and the latest technological innovations based on LiDAR and SODAR technologies (Honrubia, Vigueras-Rodríguez, & Gómez-Lázaro, 2012). Students also used equipment capable of obtaining the characteristic curves of photovoltaic solar panels (Honrubia, Cañas-Carretón, Martín-Martínez, & Gómez-Lázaro, 2013); thermal imaging cameras capable of recording images and video; power quality analysers used to record power system disturbances; and other laboratory

devices, such as programmable power sources, electrical loads and instruments for recording different variables. Between 4 and 6 sessions were held annually. These sessions were organised according to the following agenda: traditional wind resource measurement systems; new systems for measuring wind resources; solar panel power curve; power quality analysis; and applied thermography.

The students completed a self-administered questionnaire composed of several scales:

Learning Styles Inventory (LSI; Kolb & Kolb, 2005). This is a well-known scale whose good reliability and validity have been repeatedly demonstrated (e.g., Kolb & Kolb, 2012; Manolis et al., 2013; Richardson, 2011). It assesses students' learning styles and classifies them as accommodators, divergers, assimilators or convergers.

Ballesteros's Transfer Scale. This scale measures students' motivation to engage their transfer of learning. A partial version of Ballesteros's Transfer Scale (2008) was adapted in a previous study (Olivos, Segovia, Honrubia, & Gómez, 2014) and showed acceptable reliability ($\alpha = .772$). This study used an extended version of the scale composed of 59 items ($\alpha = .950$), to which participants responded on a Likert scale from 1 = *strongly agree* to 4 = *strongly disagree*. Ballesteros suggested that this scale measures 20 factors of transfer: student training motivation; absorption capacity; practical nature of training; relevance of content; content about objectives; content about self-direction (barriers); application opportunities; media availability or resources; support from superiors (teachers); support from subordinates; organisational culture of continuous learning; motivation of trainers (tutors); ability to articulate knowledge; ability to create a smooth relationship; tacit knowledge; complex knowledge; new knowledge; specific knowledge; outcome of training; transfer of training. To adapt this scale to the present study, "support from subordinates" was not included in the analysis.

Maya's Transfer Scale. This scale, adapted from Maya's version (Maya & Olivos, 2012; Maya et al., 2016), comprised 21 items. In this study, the scale had good reliability ($\alpha = .948$). According to its author, the scale measures transfer in four dimensions: teachers and family; intention to apply learned knowledge; work environment; and superiors (teachers) and colleagues.

Satisfaction Scale. This scale measured students' level of satisfaction with the learning activities and was composed of 7 items ($\alpha = .919$) that were assessed on a scale from 1 = *very bad* to 10 = *very good*. The items measure the relevance of the activities to academic performance; quality of equipment used in the laboratory; presentation of content by university staff; organisation of activities; quality of facilities; satisfaction of expectations; and general assessment of the activities.

Students also had the opportunity discuss what they considered to be the best and worst activities in two open questions at the end of the questionnaire.

The responses were recodified and analysed using SPSS 20, to perform descriptive analysis of main variables, mean comparisons, Pearson correlations and discriminant analysis to study the relation between learning styles and motivation to transfer.

The research was carried out according to the protocols and ethical standards for research veiled by the Vice Chancellor for Research and Scientific Affairs of the University of Castilla-La Mancha.

Results

A descriptive analysis of the distribution of learning styles showed that assimilators (54.4%) and convergers (29.1%) predominated, followed by divergers (11.4%) and accommodators (5.1%).

As shown in Fig. 2, most students reported satisfaction with the activities, indicating that the training programmes were evaluated positively ($M = 7.6$; $SD = 1.71$). The "quality of facilities" was the highest-rated factor ($M = 8.1$; $SD = 1.68$) and "relevance of the activities to academic performance" was the lowest ($M = 6.9$; $SD = 2.15$).

An ANOVA was performed to compare means of satisfaction according to the learning styles, but the results did not show any significant differences.

A bivariate Pearson correlation analysis was conducted to determine the relationship between transfer and participants' satisfaction with the activities (Table 1). The results showed positive and moderately strong correlations between Ballesteros's Transfer Scale ($r = .708$; $p < .01$) and Maya's Transfer Scale ($r = .706$; $p < .01$) and "the relevance of the activities to academic performance", as expected.

Several additional positive moderately strong correlations were found. The strongest correlations were found between "the relevance of the activities to academic performance" and Ballesteros's "media availability or resources" ($r = .661$; $p < .01$); "support from superiors (teachers)" ($r = .643$; $p < .01$); "organisational culture of continuous learning" ($r = .649$; $p < .01$); "tacit knowledge" ($r = .669$; $p < .01$); and "transfer of training" ($r = .651$; $p < .01$) dimensions. Correlates were also found with Maya's "intention to apply learned knowledge" ($r = .729$; $p < .01$) and "work environment" ($r = .688$; $p < .01$) dimensions.

Moderately strong positive correlations were also found between "satisfaction of expectations" and Ballesteros's "outcome of training" ($r = .617$; $p < .01$) and "transfer of training" ($r = .690$; $p < .01$) dimensions.

Only one association yielded a significant negative correlation: the relationship between Ballesteros's "specific knowledge" dimension and the "quality of facilities" ($r = -.522$; $p < .01$) factor.

Next, an analysis was conducted to determine the relationship between the four transfer dimensions, as dependent variable, and the learning styles as independent.

Table 2 shows the results of a stepwise discriminant analysis, which revealed that two functions, "Student training motivation" (Function 1) and "media availability or resources" (Function 2), significantly explained the model. The former explained 97.1% of the model variance and the latter only 2.9%. The full model distinguishes between the groups (Wilks' $\lambda = .459$; $\chi^2 = 21.028$; Sig. = .002). However, the second function alone is not adequate to distinguish the groups (Wilks' $\lambda = .968$; $\chi^2 = .879$; Sig. = .644).

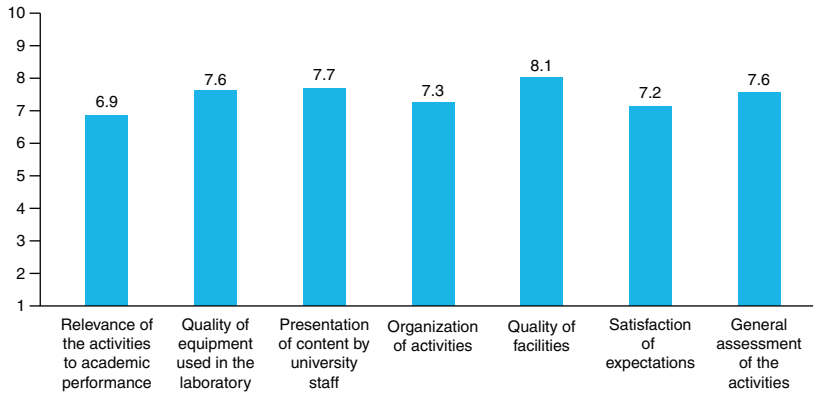

Fig. 2 – Average evaluation of satisfaction with the activities.

The classification procedure adjusted to the size of the groups classified a more than equitable distribution in 56.4% of the cases. However, pairwise group comparisons and centroid analysis showed that only Function 1 clearly distinguished between assimilators and convergers. To a lesser extent, Function 2 distinguishes between accommodators and convergers and between divergers and assimilators. These results suggest that assimilators, more than convergers, believe that student

Table 1 – Bivariate correlation between transfer and participants' satisfaction with the activities.

	1	2	3	4	5	6	7
Transfer Ballesteros	**.708	*.382	*.472	**.592	.250	**.526	**.618
Practical nature of training	**.523	.123	.354	.368	.087	.285	*.469
Relevance of content	**.511	**.514	.383	*.436	.253	.272	*.437
Contents about objectives	**.574	.282	*.476	**.536	.058	.157	.378
Content about self-direction (barriers)	.330	.288	.370	.295	.046	−.030	.271
Application opportunities	*.487	.226	.354	*.489	.071	.230	.322
Media availability or resources	**.661	.176	.307	**.541	.280	**.539	**.631
Support from superiors (teachers)	**.643	.299	*.420	**.564	.109	.373	*.408
Organisational culture of continuous learning	**.649	.140	.318	**.511	.180	**.637	**.624
Motivation of trainers (tutors)	.324	*.482	**.511	.328	*.429	.148	.304
Ability to articulate knowledge	**.498	.303	*.458	**.527	.188	*.433	*.392
Ability to create a smooth relationship	.169	.130	.218	.281	−.205	.185	.000
Tacit knowledge	**.669	**.546	.289	**.497	*.392	**.497	**.567
Complex knowledge	.301	.139	.245	.274	.299	.280	.375
New knowledge	.240	−.130	.093	.184	−.385	−.124	−.085
Specific knowledge	−.214	*−.390	−.003	−.132	**−.522	−.194	−.244
Absorption capacity	*.465	.330	.269	.267	.366	*.440	**.662
Student training motivation	.349	*.412	.308	.283	.249	.283	*.433
Outcome of training	**.554	*.415	**.529	**.547	*.399	**.617	**.611
Transfer of training	**.651	.372	.374	**.559	.295	**.690	**.632
Transfer Maya	**.706	*.461	**.492	**.548	.201	*.439	**.569
Teachers and family	**.568	*.456	*.401	*.478	.174	.365	*.388
Intention to apply learned knowledge	**.729	*.477	*.486	**.536	.177	.365	**.597
Work environment	**.688	.369	.354	*.444	.283	*.476	**.605
Superiors (teachers) and colleagues	*.485	.239	**.515	*.456	.058	.365	*.456

Note: 1. Relevance of the activities to academic performance; 2. Quality of equipment used in the laboratory; 3. Presentation of content by university staff; 4. Organisation of activities; 5. Quality of facilities; 6. Satisfaction of expectations; 7. General assessment of the activities.

* $p < .05$

** $p < .01$

Table 2 – Stepwise discriminant analysis, pairwise group comparisons, coefficients and centroids.

	Pairwise group comparisons				% of variance	λ Wilkis	Centroids
	1	2	3	4			
Function 1							
1. Accommodators		.886	.000	3.942	97.1%	**.459	1.270
2. Divergers	.886		2.577	2.191			−.675
3. Assimilators	.000	2.577		**12.341			.740
4. Convergers	3.942	2.191	**12.341				−1.475
Function 2							
1. Accommodators		3.046	.419	**5.696	2.9%	.968	−.423
2. Divergers	3.046		*4.291	1.242			.238
3. Assimilators	.419	*4.291		***11.590			.033
4. Convergers	**5.696	1.242	***11.590				−.159

* $p < .05$.
** $p < .01$.
*** $p < .001$.

motivation significantly affects transfer of learning gained through the of laboratory practicums.

These results agree with students' responses to the open-ended questions. Participants mentioned that the activities' practicality and the University's facilities were the best aspects of the training and identified the extent of the theoretical explanations and lack of opportunities for individual practice as the worst aspects.

Discussion and conclusion

The positive and moderately strong correlations found between transfer dimensions and activity assessments suggest that a positive evaluation is associated with high motivation to transfer the knowledge gained through the training experience. The specific correlations of transfer with "media availability or resources", "work environment", "support from superiors (teachers)", "organisational culture of continuous learning", "tacit knowledge" and "intention to apply knowledge" show the importance of: (a) the environmental conditions of the institutions to which knowledge is transferred; (b) the role of the teachers as mentors of students' learning processes; (c) and the content transmitted in the training programme.

The difference in distribution according to learning styles is a limitation for the statistical analysis. However, predominance of assimilators and convergers among students is consistent with the relationship between learning styles and vocational interests; these learning styles are typically closely related with the preference for certain types of careers (e.g., McCarthy, 2010).

Despite the above, discriminant analysis revealed a clear distinction between assimilators and convergers with regard to student motivation. This result indicates that students that tend to process information through reflexive observation are more disposed to transfer their learning because they are more personally motivated than those that tend to engage in active experimentation processes. Convergers are more pragmatic and prefer to conduct direct experiments than to listen to lectures. In fact, one of the most negative comments about the learning activities was related to the extent of the theoretical explanations and lack of opportunities to engage in individual practice with the university's equipment.

Therefore, the usefulness of the activities provided by the university was perceived differently by students with different learning styles. This information could be used to plan more effective training activities and assess transfer of learnings.

Thus, the University provided an opportunity for vocational students to participate in laboratory experiments by giving them access to facilities, equipment and professionals that were unavailable in their institutions. Indeed, these opportunities were highly valued by the students. Furthermore, as literature shows, learning styles could be modification by practical training (e.g., Bitran, Zúñiga, Pedrals, Padilla, & Mena, 2012; Mitchell, James, & D'Amore, 2015; van den Berg, 2015), thereby expanding opportunities to ensure transfer of learnings to the training process.

Nevertheless, the results of this study should be interpreted with caution due to their limitations. First, the sample size prevents the results from being generalised to all regional vocational students. As we mentioned before, future studies should use samples balanced across each learning style. Future research should also be conducted to determine the causal effects of the practicum design on students' evaluations of the activities according to their learning style, though the results reported in this study are consistent with the prevailing theories and with other empirical studies linking satisfaction with instructional and learning styles (Gurpinar, Kemal, Mamakli, & Aktekin, 2010). The results also corroborate other studies that have identified individual and situational characteristics as significant predictors of training motivation and outcomes (Colquitt, LePine, & Noe, 2000). The results suggest ways to improve the planning of these types of training activities.

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